Co-funded by the European Union
german cooperation
DEUTSCHE ZUSAMMENARBEIT
Norwegian Embassy
Islamabad

COMPUTER AIDED DESIGNING (CAD)

Teaching and Learning Guide

National Vocational Certificate Level 2

Version 1 - August 2019

NAVTTC
Implemented by
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Published by
National Vocational and Technical Training Commission
Government of Pakistan

Headquarter
Plot 38, Kirthar Road, Sector H-9/4, Islamabad, Pakistan
www.navttc.org

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TVET Sector Support Programme

This document has been produced with the technical assistance of the TVET Sector Support Programme, which is funded by the European Union, the Federal Republic of Germany and the Royal Norwegian Embassy and has been commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ). The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in close collaboration with the National Vocational and Technical Training Commission (NAVTTC) as well as provincial Technical Education and Vocational Training Authorities (TEVTAs), Punjab Vocational Training Council (PVTC), Qualification Awarding Bodies (QABs)s and private sector organizations.

Document Version
August, 2019
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INTRODUCTION

AutoCAD software is used by draftsmen and other professionals for preparing the layouts and designs in architecture industry. It is also used in other industries for designing the layout of the products and their components in three dimensions.

The National Vocational & Technical Training Commission (NAVTTC) has developed a national qualification entitled, “National Vocational Certificate Level-2 in Information Technology (CAD-AutoCAD)”. Relevant industry and employers were consulted in the design and validation processes in order to come up with a national qualification that fulfills the requirements of the sector in general and the occupation in particular.

This Teaching and Learning Material (TLM) is developed based on competency standards and curriculum of the AutoCAD national qualification. It includes three learning modules which are as under:

Module 1: **Perform Basic Computer Operations.**
Module 2: **Develop 2D Drawings using AutoCAD.**
Module 3: **Develop 3D Model using AutoCAD**.

This TLM provides support for more effective training and productive learning. Each of the learning modules contains learning outcomes and information regarding learning elements in the form of knowledge, skills and attitudes. At the end of every learning module are Frequently Asked Questions (FAQs) and Test Yourself which will help learners in self-assessment before proceeding to modular or final assessment.

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Module-1

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Module 1: Perform Basic Computer Operations

Objective:

The objective of this module is to provide skills and knowledge related to basic computer hardware, software, applications and troubleshooting. You will be able to demonstrate your skills in operating a computer system and computer applications such as MS Word, MS PowerPoint, MS Excel as well as installation and troubleshooting of operating system and software.

Learning Outcomes:

After Completion of this learning module, you will be able to:

- Configure Computer System
- Create a Document using MS Word
- Preparer a Worksheet using MS Excel
- Prepare a presentation using MS PowerPoint

Learning Unit 1:
Configure Computer System

After completion of this Learning Unit you will be able to:

- ❖ Connect computer components and peripherals as per requirements.
- ❖ Install system software and application software according to the Instructional Manual.
- ❖ Troubleshoot applications to trace and fix faults (if any) to bring it in a running condition.
- ❖ Follow health, safety and security procedures to ensure safe working environment.

1. Configure Computer System

In communications or **computer systems**, a **configuration** of a **system** refers to the arrangement of each of its functional units, according to their nature, number and chief characteristics. Often, **configuration** pertains to the choice of hardware, software, firmware, and documentation.

1.1. Computer components and peripherals

A peripheral is a "device that is used to put information into the computer or get information out of the computer. Peripheral device is generally defined as any auxiliary device such as a computer mouse or keyboard that connects to and works with the computer in some way. Other examples of peripherals are image scanners, tape drives, microphones, loudspeakers, webcams, and digital cameras. This learning unit covers about most commonly used peripheral devices and commonly used communication ports in computer. After completion of this learning unit you will be able to describe different types of peripheral devices and their use. And most commonly used hardware ports.

Remember

The word computer comes from a **Latin word "Compute"** which means to calculate.

1.1.1. Identify basic components and peripheral devices of computer system.

A computer peripheral device is an external device that provides input and output for the computer. There are three types of peripheral devices one is input that is used for providing input to the computer, second is output that is used for providing output and the last one provides input and output both

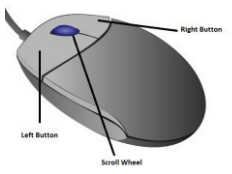
- **Input**
  Everything that we give to computer is known as Input. Some common input devices include:

Remember

Computer is an electronics machine that accepts the **instruction** in the form of **Input** and after process gives us i**nformation** in the form of **Output**.

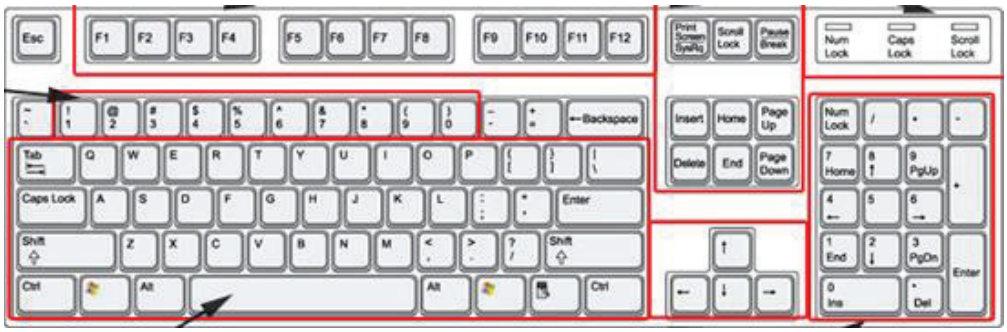
i. Keyboard
ii. Mouse
iii. Scanner
iv. Microphone
v. Joystick:

i. **Mouse**
A mouse is an input device used to point and select items on the computer screen. A Mouse controls the movements of cursor. A mouse usually has two buttons: A primary button (usually the left button) and a secondary button. Many mouse also have a wheel between the two buttons, which allows to scroll for ups and down options.



ii. Keyboard

A keyboard is used for typing text into the computer. There are many types of keys on the keyboard like, Numeric Keys, Alphabet Keys and Function Keys.



iii. Scanner:

A scanner is an input device that is used to send text, graphics or images into computer

iv. Microphone:

Microphone is an instrument for converting sound waves into electrical signal.

It is sometimes abbreviated as "**mic"**. A microphone is a peripheral that allows computer users to input audio into their computers.

v. Joystick:

Joystick is a lever that moves in all directions and controls the movement of a pointer or some other display symbol. A joystick is similar to a mouse.

Joysticks are used mostly for computer games.

- **Output**

Everything that we receive after process is knows as output. Some common output devices include:

i. Monitor
ii. Projector
iii. Printer
iv. Plotter
v. Speakers

i. **Monitor**

A **monitor** is an output device used to visual display information. Monitor looks like a television screen. There are four basic types of monitors: **CRT** (cathode ray tube) monitors, the **LCD** (liquid crystal display) monitors, **TFT** (thin film transistor) monitors, and **LED** (light emitting diodes) monitors. All monitors produce sharp images, but LCD, TFT and LED monitors have the advantage of being much thin and lighter.

ii. **Printer**

A printer is an output device used to transfer text, or image or photographs onto paper. Printer generates the hard copy information.

iii. **Projector**

A projector or image projector is an optical device that projects moving images onto a large screen.

iv. **Speaker:**

Speaker is one of the most common output devices used with computer. The purpose of speakers is to produce audio output that can be heard by the listener.

v. **Plotter**

Plotter is an output device similar to printer but print the large-scale printing

- **There are some devices that functions both as input and output devices, such as:**

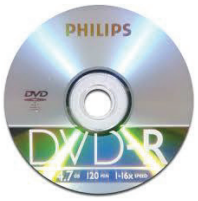
i. **Hard drives**
ii. **CD/DVD ROM Drive**
iii. **Modems**
iv. **Webcam**

Remember
You can store a large amount of data on Hard disk. External hard disks are also available for data backups.

i. Hard disk drive

Hard disk drive is a sealed vacuumed unit that stores information permanently. Hard disk comes in the market with different size, capacity and shape. Size means 2 ½" used in laptop and 3 ½" is used in personal computer and capacity and shape means SATA or ATA (IDE).

ii. CD (Compact Disc) and DVD (Digital Video Disc) drives



CD or DVD drive, usually located on the front of the system unit. CD drives uses lasers to read data from a CD; many CD drives can also write (record) data onto CDs. A DVD drive can do everything that CD drive do, but read DVDs also. Many DVD drives can record data onto blank DVDs. This readable DVD-RW is also called **Combo drive.**

iii. Modem

Modem is a short name for modulator-demodulator. A modem is a device that enables a computer to transmit data over telephone or cable lines. A modem converts between these two forms from analog to digital and digital to analog. There are two types of modem wired and wireless.

iv. Web Cam:

A webcam short for "web camera" is a digital camera that is connected to a computer. It can send live pictures. Many desktop computer screens and laptops come with a built-in camera and microphone, but if it doesn't, separate webcam can be connected any time.

Do you know?

Any images you make available to others via webcam could remain on the internet forever.

- **Different Types of Communication Ports:**

In computer hardware, a **port** serves as an interface between the computer and other computers or peripheral devices. A port generally refers to the female part of connection. Computer ports have many uses, to connect a monitor, webcam, speakers, or

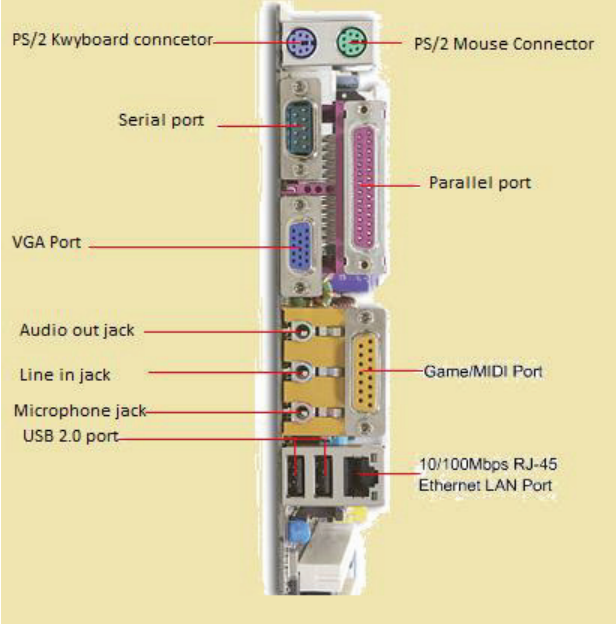
Remember

Communication ports are the gateway for data between devices and computers.

other peripheral devices. These **ports** are connection points or interfaces with other peripheral devices.

Physical ports/ Communication ports are used for connecting a computer trough a cable and a socket to a peripheral device. Physical **computer ports** list includes:

i. Serial ports (DB9 socket),
ii. USB ports (USB 2.0 or 3.0 socket / connector),
iii. Parallel ports (DB25 socket / connector),
iv. Ethernet /internet ports (RJ45 socket / connector).
v. VGA port (Display port)
vi. Fire wire (IEEE 1394 interface)
vii. E-SATA port
viii. PS/2 port



i. Serial Ports:

Serial port is an electronic communication gateway used for transferring data one bit at a time. Serial port was used almost for all type of information transfer between a computer and other peripheral devices. Nowadays serial port has been replaced with dedicated ports like USB port. The serial port is also known as COM port and when a device is connected to it you will found it in device manager on port COM1 or COM2.

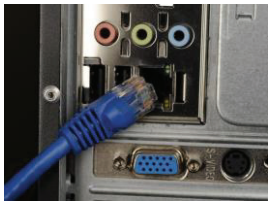
Do you know!

Serial ports transfer data bit by bit and parallel port transfer data byte by byte.

ii. USB Port:

USB port (Universal Serial Bus) is the most useable connection point for data transfer in the world. It was created in the mid-1990s with the intention of replacing all other PC ports like serial port, parallel port, PS/2 port. A standard USB connector is a simple socket with 4 pins: one for power, one for ground and two for data transfer.  Is used for USB.

iii. Ethernet Port:

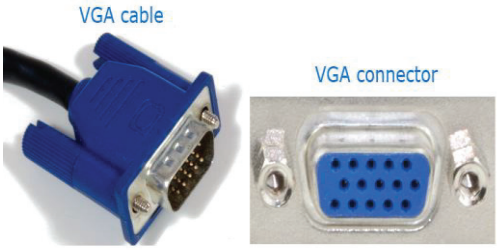


Ethernet port is a network hardware interface used for data transfer and control between two devices that can support the IP protocol. The Ethernet port speed can vary 10Mbps up to 10Gbps.

Do you know!

Ethernet port is also called internet connection port.

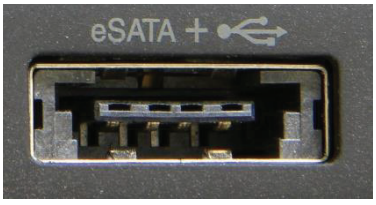
iv. VGA Port:



The **VGA** port is used for connecting a computer to a monitor. It was the replacement of MDA, CGA and EGA standards.

With the development of new and powerful processing units came the need of a new video standard and this is how the VGA port was invented. This new standard brought with VGA monitors compatible with 640×480 resolution.

v. E-SATA Port:



An e-SATA is a combined connection for external storage devices. An e-SATA or USB device can be plugged into an e-SATA port. **SATA** is a computer bus interface for connecting host bus adapters to mass storage devices such as hard disk drives and optical drives. e-SATA combines the functionality of an e-SATA and a USB port, and a source of power in a single connector. E-SATA can supply power at 5 V and 12 V.

- **Basic Parts of Computer System**
  A computer is an electronic device which takes input from the user, processes it and gives output. Computer consists of several parts like CPU, Mouse, Keyboard monitor, LCD, Printer, and Speakers. These parts may be different according to the system. Like in laptops, touchpad replaces mouse, built in speakers in LCD and built in laptop.

Remember

The word computer comes from a Latin word “Compute” which means to calculate. So, it is also called a calculating device.

- **Basic Components of Computer System**
  There are three basic components of computer system. CPU or system unit, Input unit and Output unit.

i. **CPU or System unit**
System unit is a base for computer system that is commonly known as CPU (Central Processing Unit). The central processing unit is "brain" of computer, which consists of the following three main parts:

Remember

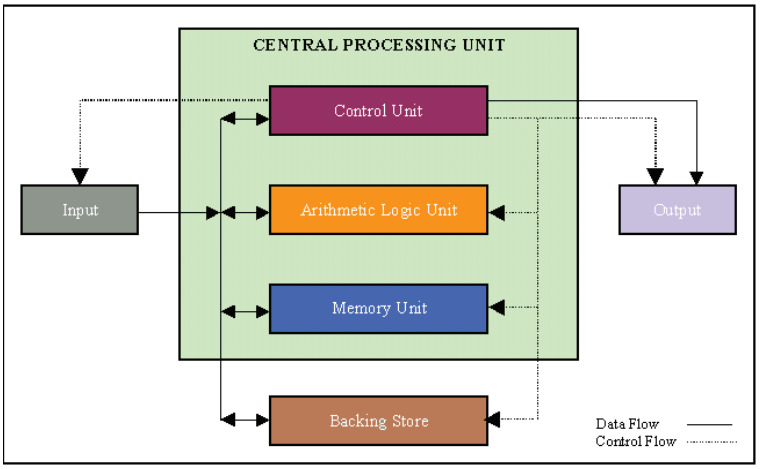
There are three basic components of computer system input unit, output unit and system unit.

ii. **Memory unit**
consists of primary memory and secondary memory. In primary memory, RAM (Random **Access Memory** is primary memory that loads the required data and erase it at the time of shutdown/restart. In secondary memory which store information on disc drives / devices permanently can be used in future again and again.

iii. **Control Unit**
it controls all the devices (peripheral devices) which attached to the computer.

iv. ALU (Arithmetic Logic Unit)

It is also called Microprocessor which is the brain of the computer, and deals with all the arithmetic (additions, multiplication, subtractions) and logical operations (greater, less then, equal etc.) of the computer.



Learning Activity:

1) Define different types of ports colors according to their connectors.
2) Plug out all the ports from the computer and connect them again for practice.
3) Write the difference between hardware and software?
4) Find out what types of drives are on your computer (CD-ROM, DVD-ROM, etc.).
5) Count the number of USB ports on your computer.
6) What are some of the peripherals you can use with your computer?

1.2. Install System Software and Application Software

Computer consists of two main parts Hardware and Software. In software, system software (Operating system) is main software which control and manage the computer and all the devices attached to it. This learning unit covers the procedure of installing operating system; describes different types of operating systems, precautions and hardware requirements for installing operating system. After completion of this learning unit, you will be able to demonstrate the procedure for installing Operating System and describes the different types of operating system and computer parts.

- **Hardware and Software:**
  Following are the two major elements of the computer.

  i. **Hardware:**
  Hardware are the physical parts of Computer that can be seen or touched. This includes the computer casing, monitor, keyboard, and mouse. It also includes all the parts inside the computer casing, such as the hard disk drive, motherboard, video card, LAN card and many others.

  Remember

  Hardware is tangible elements and software is intangible elements of computer. Hardware and Software are dependents on each other

  ii. **Software:**
  The set of instructions given to the computer to perform a task is called software. **Computer software** or **software** is any set of machine-readable instructions that directs a computer's processor to perform specific operations. The two main types of software are system software and application software. Following are the two main types of software.

  System software: System software is computer software designed to operate and control the computer hardware and to provide a platform for running application software. It includes software like operating system language software, device drivers

  Application Software includes word processing software, spreadsheet software, database software, education software, entertainment software and many more.

- **Types of Operating Systems:**

  Operating System:
  An operating system (OS) is a master kind software that control overall system including hardware and software and application software. During running it coordinate with all hardware and software and utility programs.

  Types of Operating Systems:
  Mostly people use the operating system that preinstalled on their computer, but it is possible to upgrade or even reinstall new operating systems. The most common operating systems for personal computers are:
  Microsoft Windows, Apple Mac OS X, and Linux, Unix etc.

i. Microsoft Windows:

Microsoft created the Windows operating system in themid-1980s. Over the years, there have been many different versions of Windows, but the most popular ones are **Windows 7** (released in 2009), Windows Vista (2007) and **Windows XP** (2001). Windows is very compatible and user friendly which makes it the most popular operating system in the world. If you're buying a new computer or upgrading to a new version of Windows, you can choose from several different editions of Windows, including Home, Premium, Professional, and Ultimate.

Remember

Windows is a multi-tasking operating system.

ii. Apple Mac OS X:

Mac OS is a line of operating systems created by **Apple Inc**. It is also preinstalled on all new **Macintosh computers**, or Macs. All of the recent versions are known as **Mac OS X (**pronounced **Mac O-S Ten)**, and their specific version names are **Lion (released in 2011), Snow Leopard (2009) and Leopard (2007)**. Apple also offers a version called **Mac OS X Server**, which is designed to operate on servers. The Apple operating system does have some disadvantages, primarily in regard to software and hardware compatibility.

iii. Linux:

Linux operating system is developed on a kernel, based on Unix. It is known as one of the most secure platforms, yet Linux is often viewed as more complex. Linux **(pronounces LINN-ux)** is a family of open source operating systems, which means that they can be **modified and distributed** by anyone around the world. This is very different from proprietary software like **Windows**, which can only be modified by the company that owns it (**Microsoft**). The advantages of Linux are that it is free, and there are many different distributions (versions) that can choose from. Each version has a different look and feel, and the most popular ones include **Ubuntu**, **Mint**, **Red Hat** and **Fedora**. Linux is named after Linus Torvalds, who created the Linux kernel in 1991.

- **What is Office Suite.**

  The Microsoft Office suite is a set of programs for common productivity tasks, including a word processing program, a spreadsheet tool, presentation software, an email program and others. Often abbreviated as the MS Office suite, it is among the most popular software packages in the world, though it does face competition from other commercial products, including some from Apple and Google and from open source packages such as LibreOffice. Parts of the Microsoft suite of programs are available both for use in a web browser and local use on a computer.

- **MS- Office**

  Microsoft office sometimes calls MS-Office is an application software that perform the specific task. Microsoft Office is a popular set of software programs from Microsoft that includes a word processor, a spreadsheet tool, a database program, an email utility and other productivity software commonly used in modern offices. You can either purchase a copy of MS Office to use on your computer or sign up for a subscription to Microsoft's cloud-based version of Office.

- **Google Docs**

  Google Docs is a free Web based application in which documents and spreadsheets can be created, edited and stored online. Files can be accessed from any computer with an internet

connection and a full-featured Web browser. Google Docs is a part of a comprehensive package of online applications offered by and associated with Google.

- **Sheet**
  A sheet is another name for a single piece of paper or a hard copy, In software, a sheet is a single page in a word processor or single worksheet in a spreadsheet.

1.2.1. Precautions to Be Taken Before Installing Windows:

Before installing any operating system, following precautions must be followed for safety and security of important data / software's.

i. Regularly take backup of your computer system data.
ii. Check the prefix for Installation of new Operating system.
iii. Check the compatibility issue before installing windows.
iv. Create check points/restore points.

- **System requirements for Windows 10:**
  For installing windows 10 we need

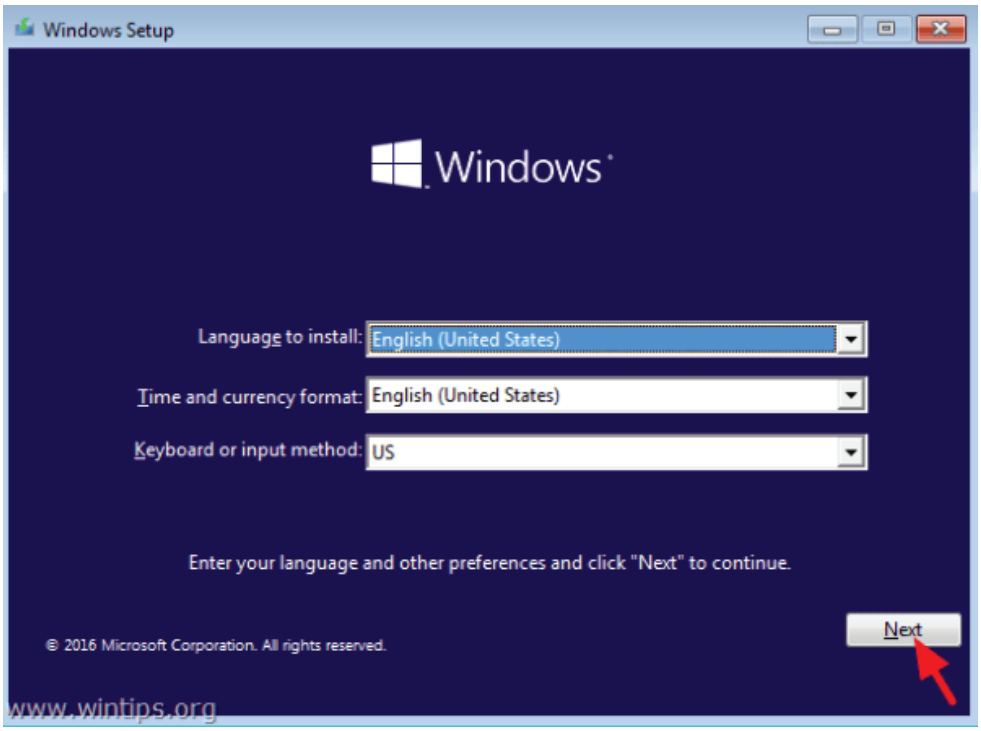
i. 1 gigahertz (GHz) or faster for 32-bit (x86) or 64-bit (x64) processor.
ii. 1 gigabyte (GB) RAM (32-bit) or 2 GB RAM (64-bit).
iii. 16 GB available hard disk space for (32-bit) or 20 GB for (64-bit).
iv. DirectX 9 graphics device with WDDM 1.0 or higher driver.

- **Installation Of Operating System**

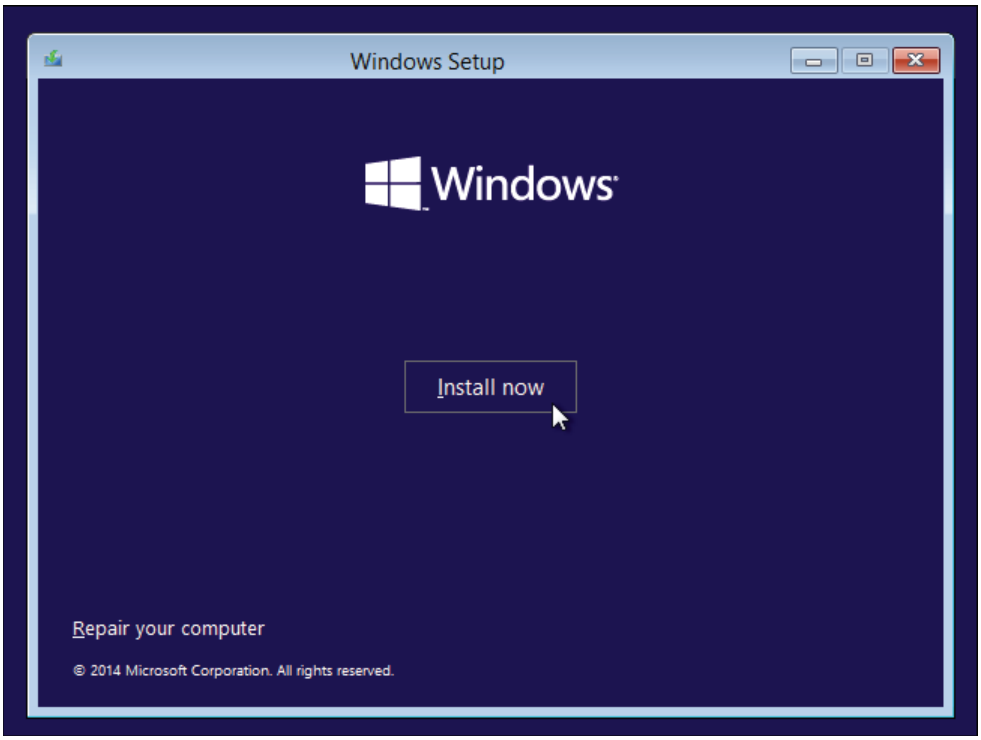
Step by Step Windows Installation

1) Boot/Start Computer from Window 10, bootable DVD or Bootable USB Flash
2) Press **Esc, F10, F2 or Delete** key from Keyboard depending upon your manufacturer.
3) If prompted, **press any key to Boot from CD/DVD……"** then press any key
4) The obvious place to start in Win 10 is with the installation process

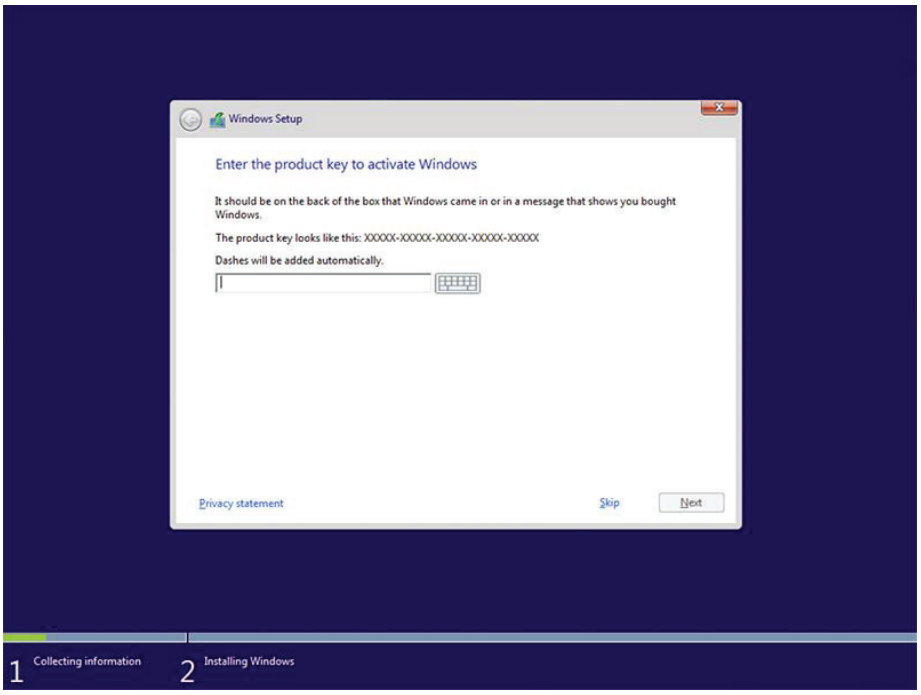
Remember
F2 key is used for entering setup of the computer system.



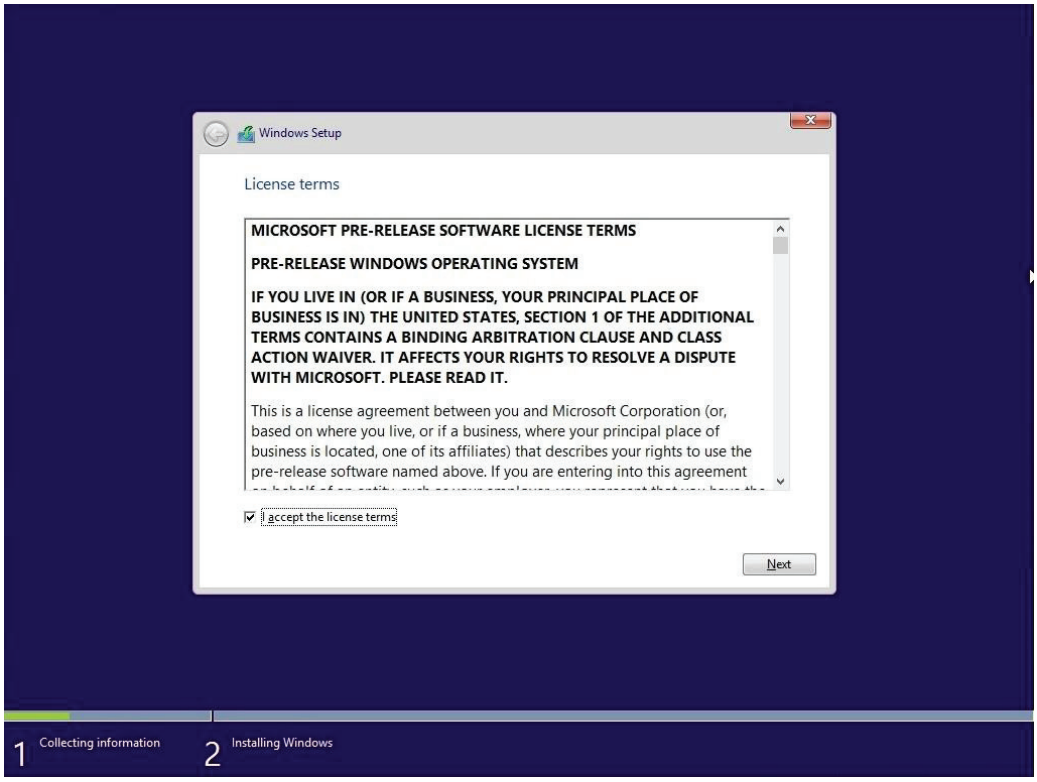
5) **Click on Install Now**

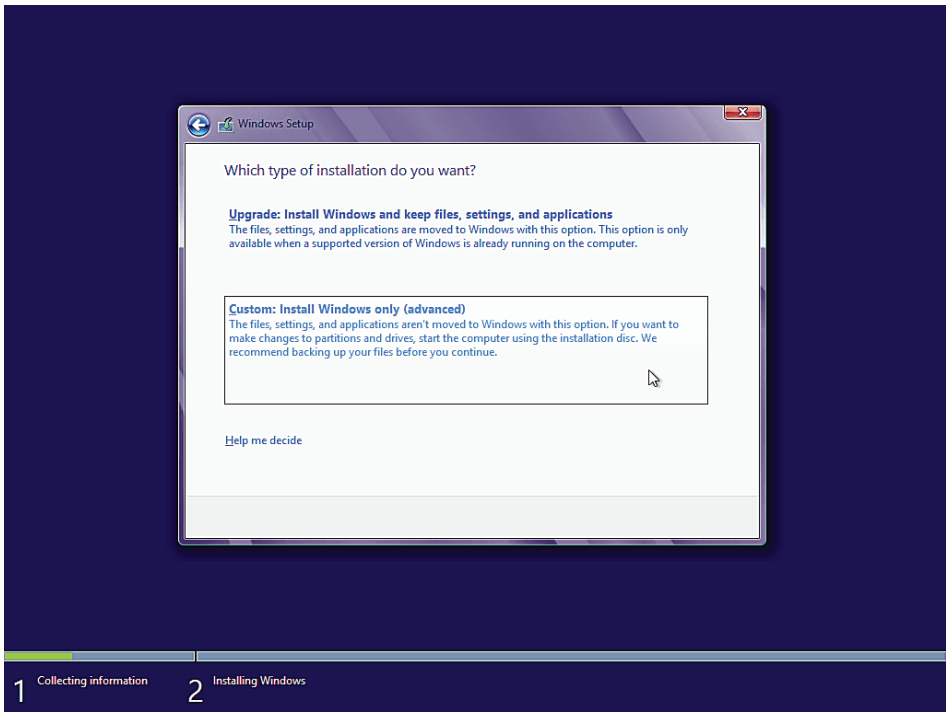


6) Enter product key or skip

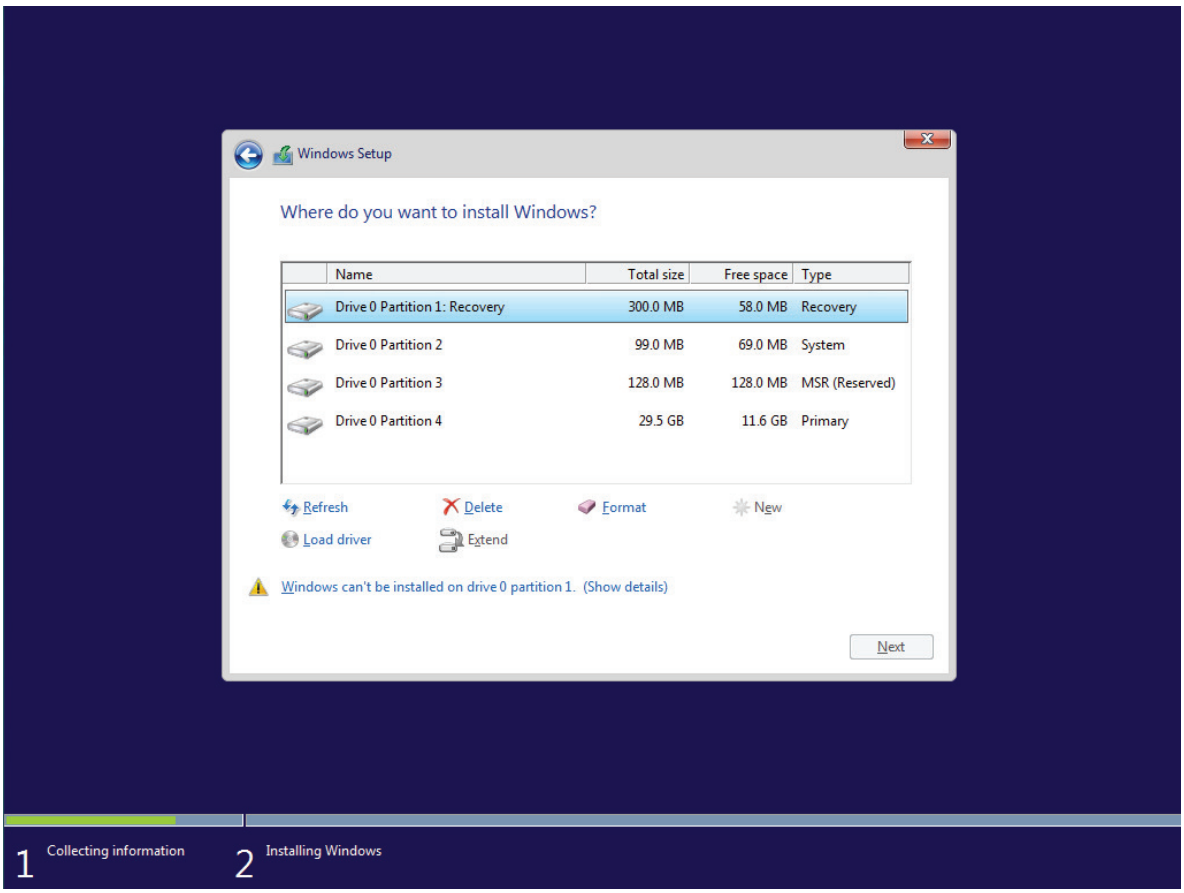


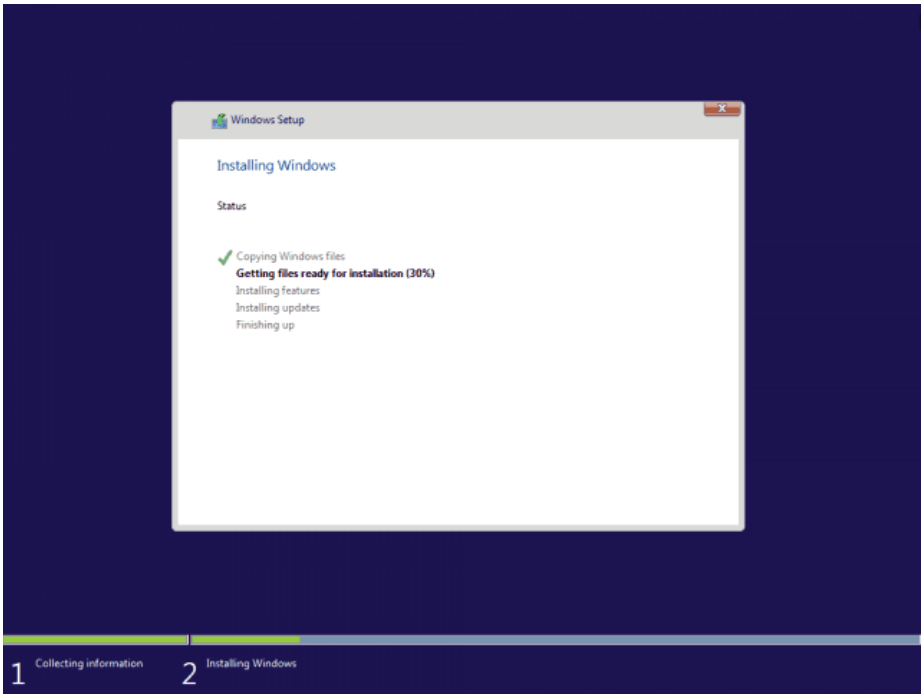
7. Click “I accept the license terms” and Select Custom



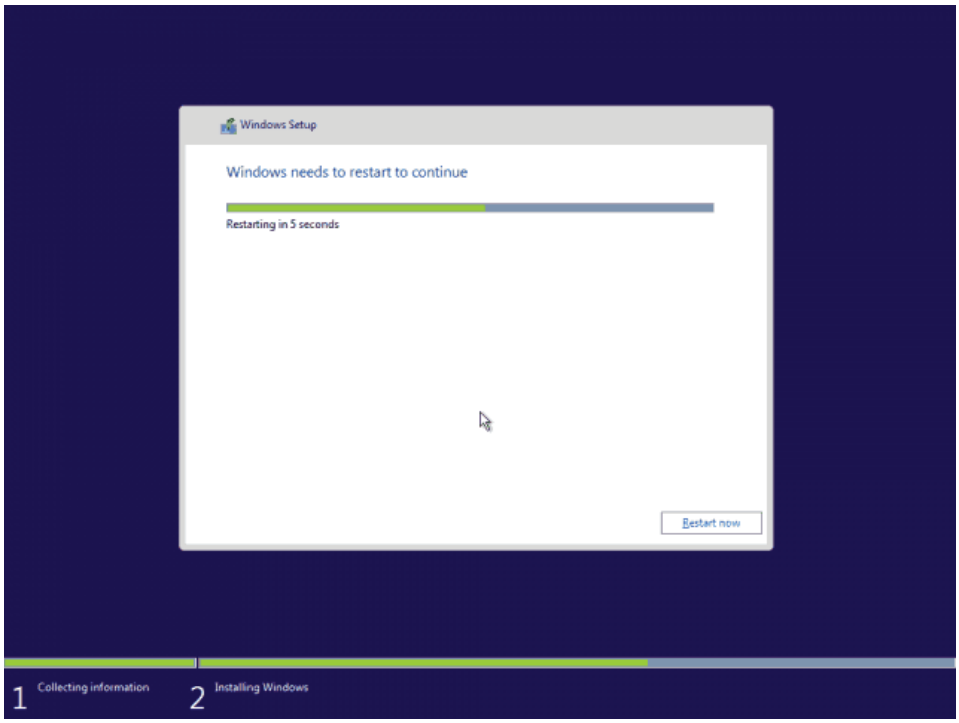


8. Select the drive where you want to install windows.

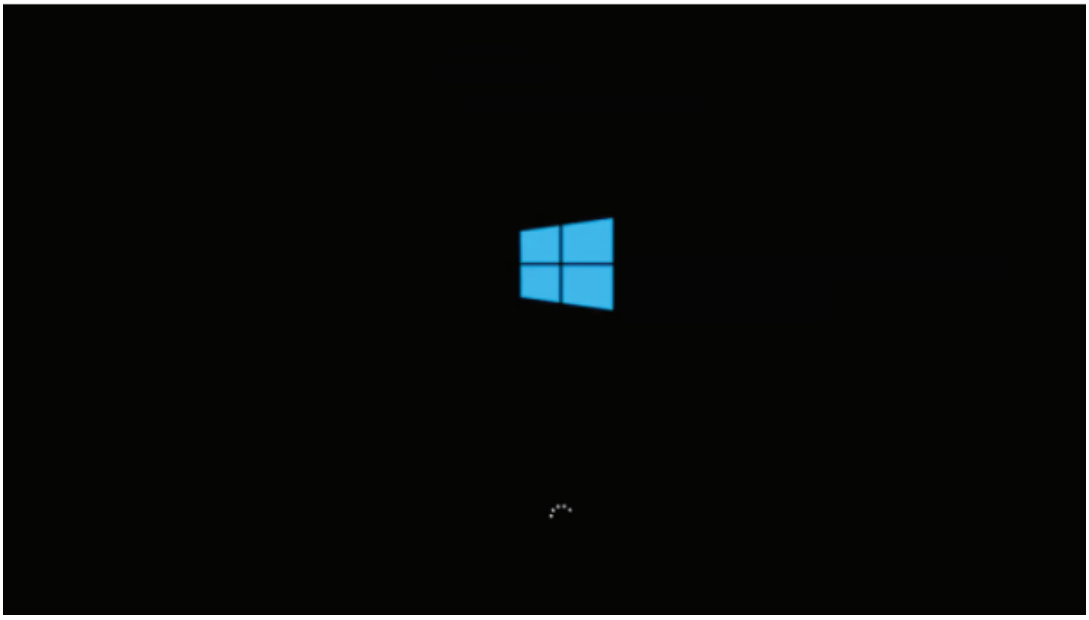




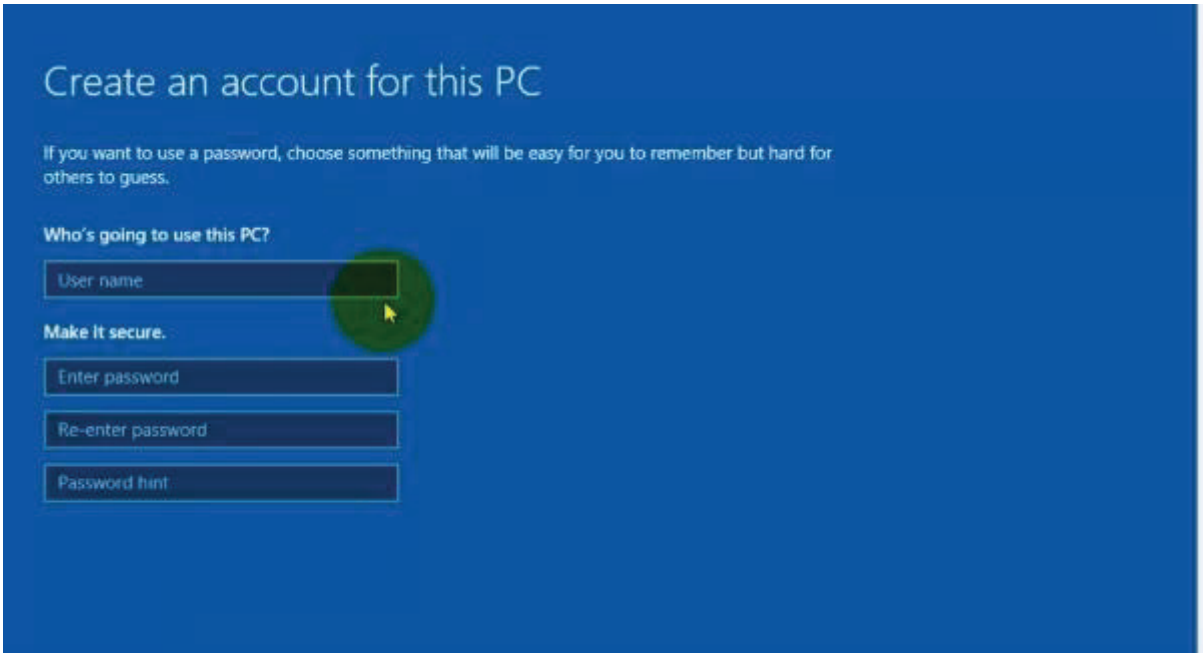
9. Now system has been restart.



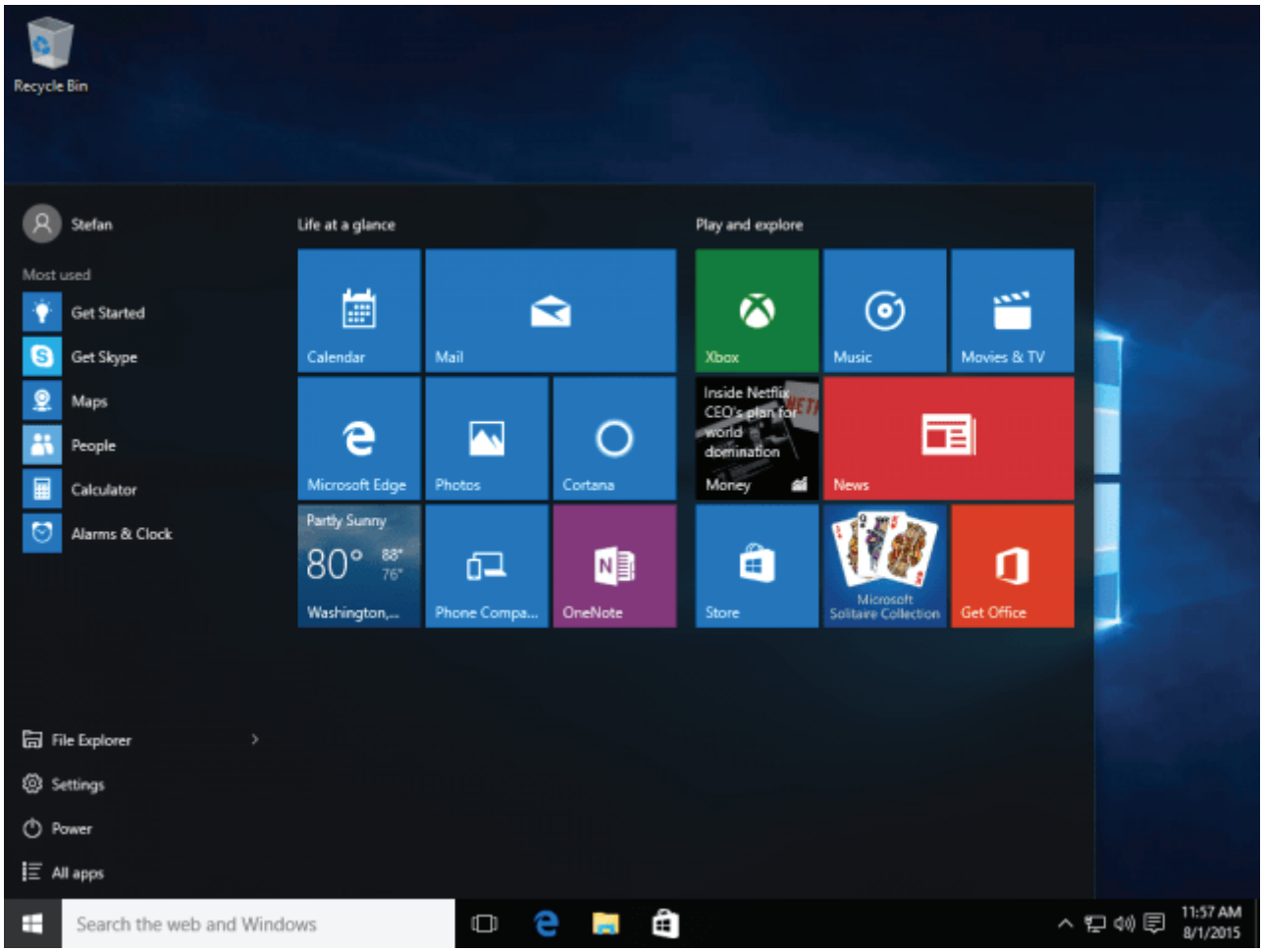
10. After Restart system shows this window



11. Enter user name, password and hint.



12. After completion of all the steps the windows will prepare your desktop



Learning Activities:

1) What is an operating system?
2) Mention the name of the operating system installed in your computer.
3) Visit the Microsoft and Apple websites to learn more about each operating system.
4) If you have a PC and currently use an older version of Windows, such as Windows 10 starter, upgrade to win 7 ultimate versions.

1.2.2. Install Software Applications

Application software is a type of software that is used to do specific tasks. This learning unit covers different types of application software and procedure of installing this software. After completion of this learning unit you will be able to describe various types of application software and how to install this software.

Remember

An application is a program, or group of programs, that is designed for the end user.

Different Software Applications

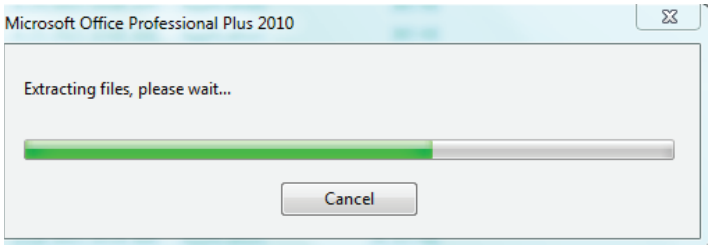
Application software is the software that is used at offices, home and school. Application software consists of programs like Word processing, Spreadsheets, Database, Graphics software, designed to perform specific tasks for users.

1.2.3. Installing Microsoft Office 2010

Step by Step Installation of Microsoft Office 2010

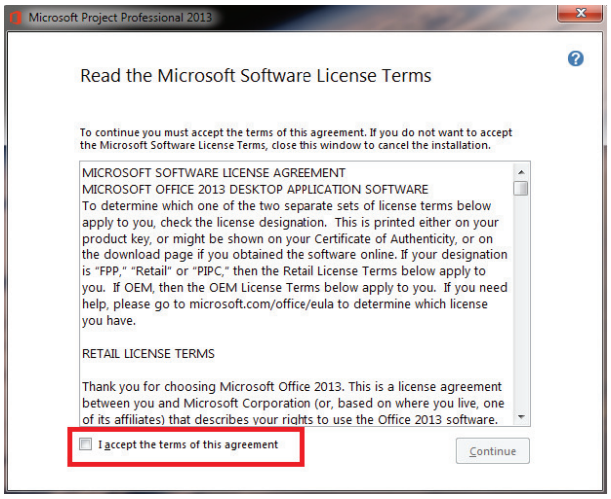
Installation of Microsoft office 2010 is very easy. If you are running an earlier version of office, such as Office 2007 the process will also upgrade you to Office 2010.

1) Insert the office 2010 DVD or double click on the downloaded setup.exe file, you will see the option



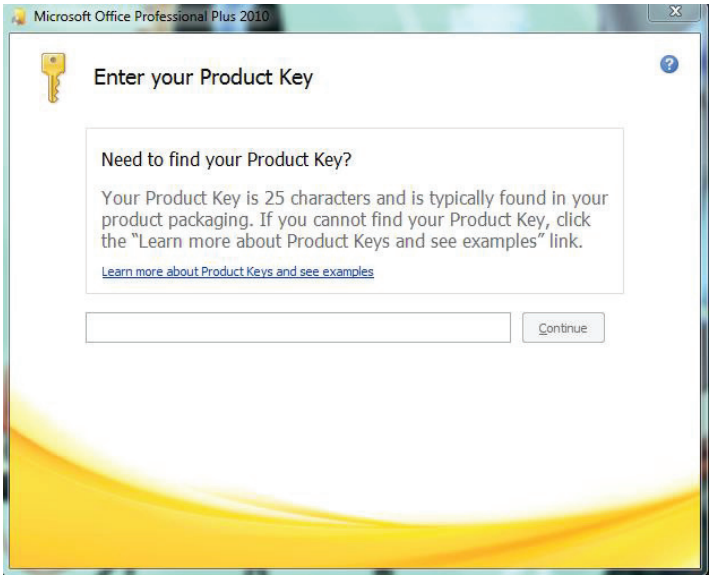
Extracting files

2) Then a window will appear simply pop a tick in the accept license conditions and click continue.



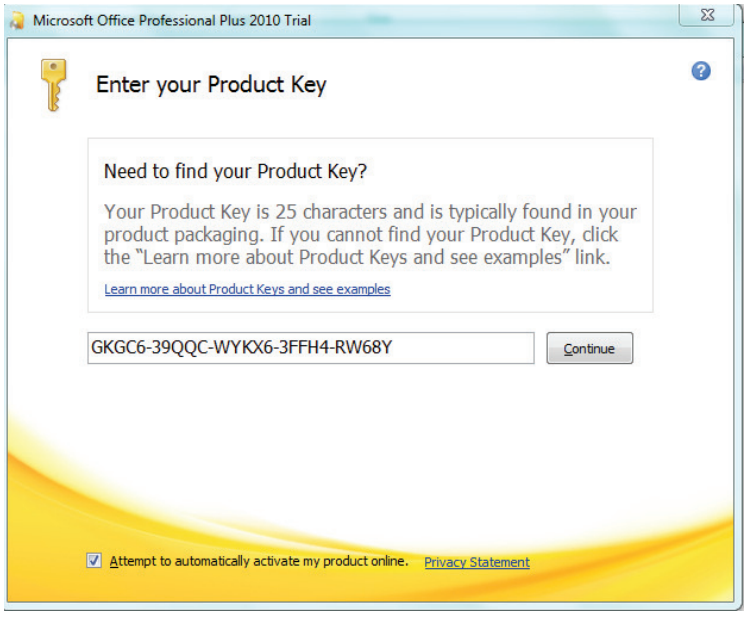
Accepting License Agreement

3) Then it will ask about the product key.



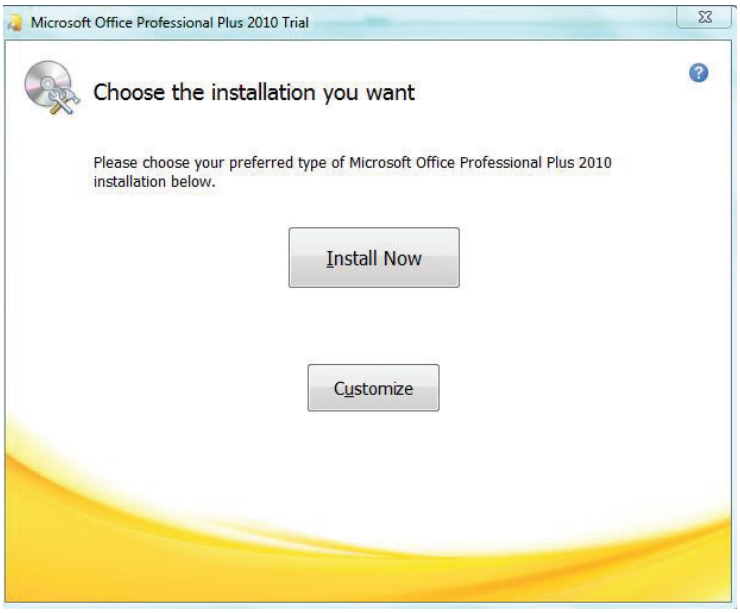
Asking for Product Key

4) Copy the product key from the text file given in the CD and paste it in the given box. Or if it is a downloaded setup the product key text file will be available with it.



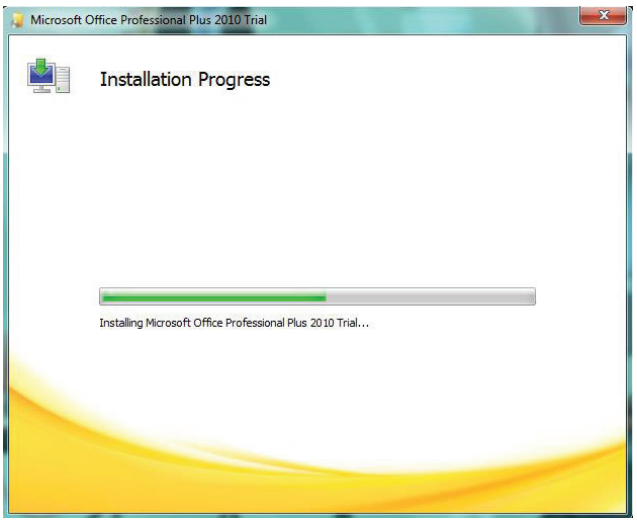
Giving Product Key

5) You now get the option to run the default install or a custom install as seen below.



Select Install now

6) Now the installation process will be started and it will take several minutes for completion of installation.



Processing installation

7) After this the completion of installation window will appear.

Completing installation

Now the installation is completed and your software is ready to use.

1.2.4. Configuration of Printer

A printer does not work without driver. If driver is not available then it can be downloaded from internet.

Connecting the printer to the computer

Connect the printer to the computer either using a USB cable, parallel port cable, or SCSI cable and then connect the power plug to a power outlet.

Do you know

If you do not see your printer in the printer's list, your printer is not installed

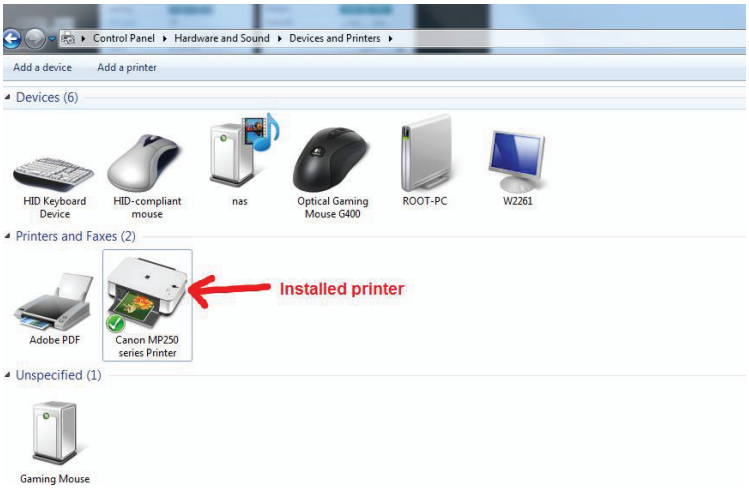
Setup printer and install software:

1) After everything has been plugged in turn the computer on.

2) Insert the CD that came with the printer. If the CD does not automatically start, open **My Computer**, double-click on the **CD drive**, and then click the **Setup** or Install file.

3) If you have downloaded the drivers, run the downloaded **setup file**.

4) Follow the installation wizard and once completed, the software is installed.



1.2.5. Installing a Scanner

Before scanning the documents into the computer with a scanner, it needs to install the scanner driver, so that scanner and computer can communicate. Start by connecting the scanner to computer's USB port. **Plug and Play**, a technology that Windows uses to recognize equipment and automatically install and set it up. If a scanner is Plug and Play-enabled, Windows 7 shows a Found New Hardware message in the Taskbar notification. Most Plug and Play devices will then automatically install, the message will change to verify the installation is complete. But now most new peripherals are available with their driver's installation CD.

1) Turn on the scanner.
2) Click the found new hardware message, click Yes, this time only, and then click Next again.
3) Insert the driver's CD in CD drive and click next.
4) Windows 7,8,10 searches for your scanner driver software automatically and installs it.
5) Click on start button in search bar type Add Device.
6) Click the Add Device button and then click Next.
7) The Scanner and Camera Installation Wizard window appears. When you click Next, the next screen of the wizard appears.

installing Scanner

8) Click a Manufacturer in the list on the left and then click a model in the list on the right.
9) (Now it's just a matter of following the wizard directions based on the model of scanner you choose and whether you have a manufacturer's disc (a CD- or DVD-ROM). If you don't have a disc, Windows can help you download software from the Internet.)
10) Click Finish when the wizard ends
11) Now the installation is complete and scanner is ready to use.

Learning Activity:

1) What are some examples of application software you have on your computer?
2) Install MS Office 2010 using CD/DVD on your computer.
3) Install Printer on your computer
4) Install Scanner on your Computer
5) Install VLC media player on your computer

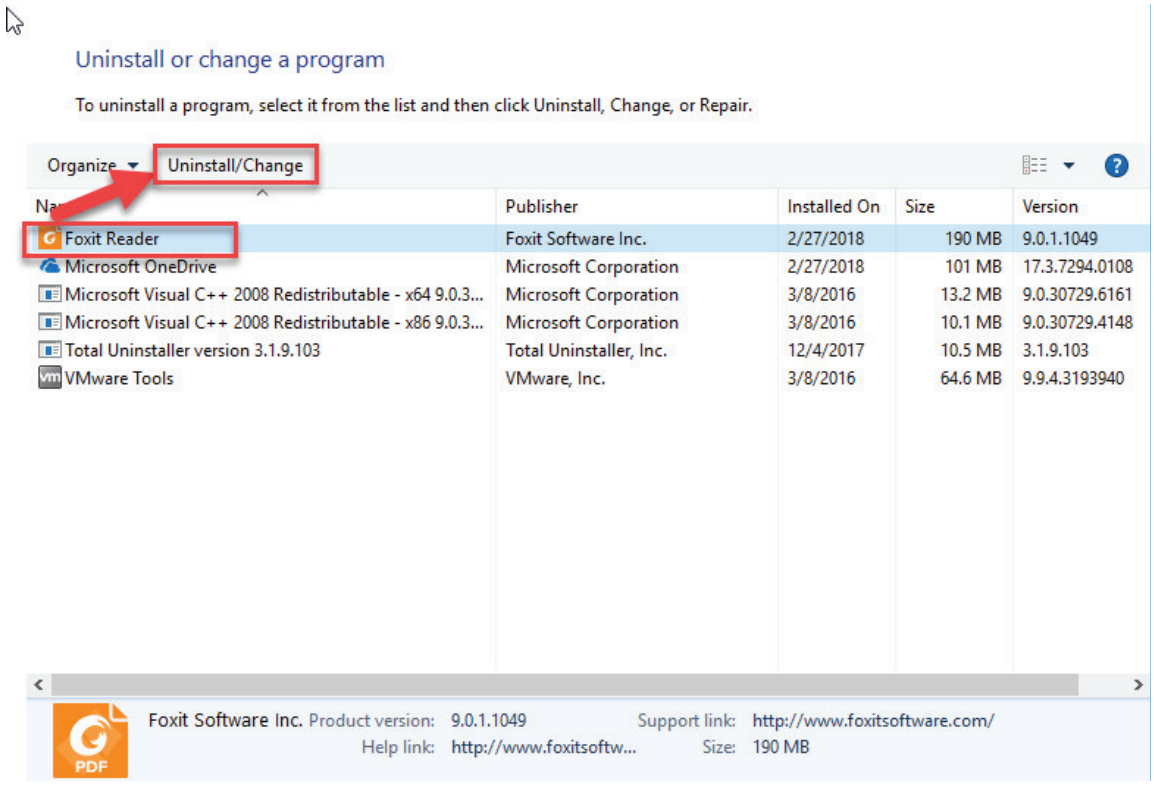
1.2.6. Uninstalling a computer Software

The proper way to uninstall a program is to use the uninstall routine that is provided with the program itself. This will remove the files, Windows Registry information, and other configuration from your computer to avoid conflicts in future. This learning unit covers about basic precautions to un install a software application, how and where to take backup of necessary data files, also demonstrate various features of control panel and the procedure for uninstalling a software from the computer.

Software must be un installed through a proper way it cannot be removed by deleting its icon from the computer or deleting its folder from windows because a large amount of information regarding configuration left in the Windows Registry as well as files that may be installed in locations other than the program's folder. These files and Registry data may cause conflicts on your computer thus leading to problems.

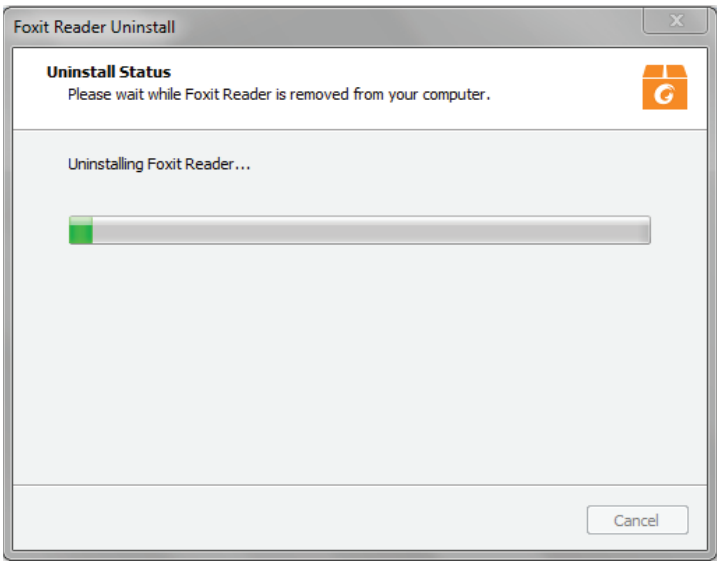
Procedure for Un-Installing A Software

1) Click on **start** button.
2) Click on control panel.
3) Click on programs and features.
4) **Select** a program, and then click **Uninstall**. Some programs include the option to change or repair the program in addition to uninstalling it, but many simply offer the option to uninstall. To change a program, click Change or Repair.



Uninstalling a software

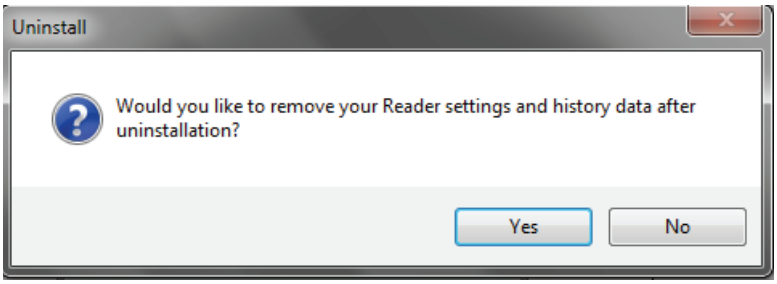
5) A dialogue box will appear for uninstallation.

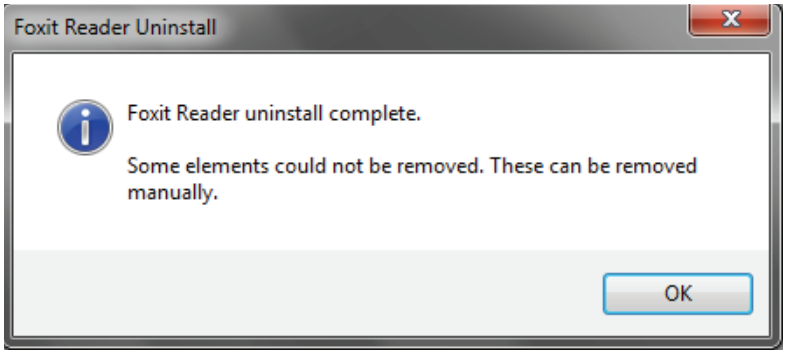


Completing Uninstalling a software

6) Then another dialogue box will appear for asking do you want to remove History.

- Click on Yes.
- Then click on OK.





Learning Activity:

1) Uninstall any unwanted software from computer?
2) Change the background of your computer?
3) Check and list the installed hardware in your computer??

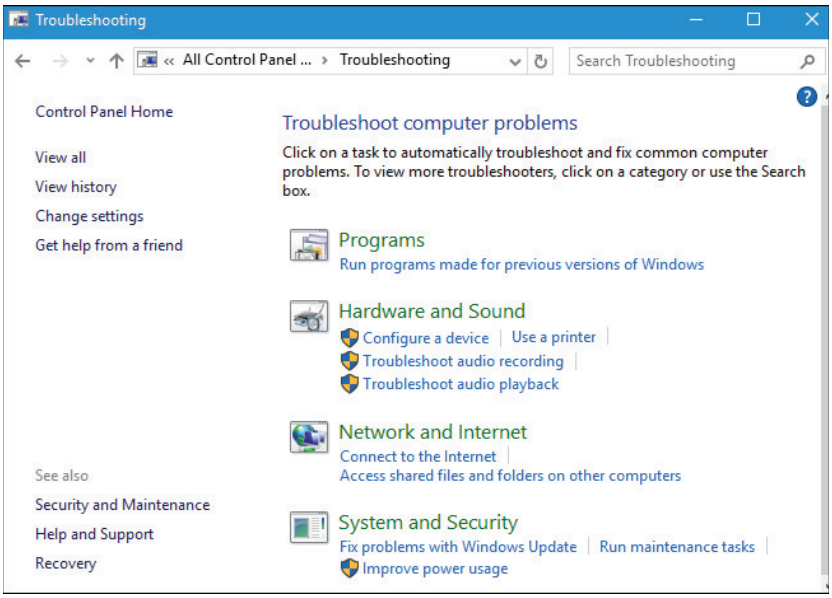
1.3. Troubleshoot Applications to trace and fix faults (if any) to bring it in a running condition.

Software troubleshooting is the process of scanning, identifying, diagnosing and resolving problems, errors and bugs in software. The software troubleshooting process starts with identifying the problem, checking on possible issues that can cause such problems and then working on measures and alternatives to find a solution.
This learning unit covers that what is software troubleshooting, describe the general software errors like computer bug, track or path corruption also will demonstrate the precautions about software troubleshooting. After completion of this learning unit, you will be able to describe what is software troubleshooting also will be able to troubleshoot errors in software.

1.3.1. Troubleshooting common Errors in windows:

Troubleshooting using Control Panel contains several troubleshooting programs that can automatically fix some common problems with computer, such as problems with networking, hardware and devices, using the web, and program compatibility.
Although troubleshooters aren't designed to fix every problem, they are useful to often save your time and efforts.

1) Open troubleshooting by clicking the **Start** button then clicking **Control Panel**, and then, under **System and Security**, click **Find and fix problems**



Simple solutions to common Computer Errors:

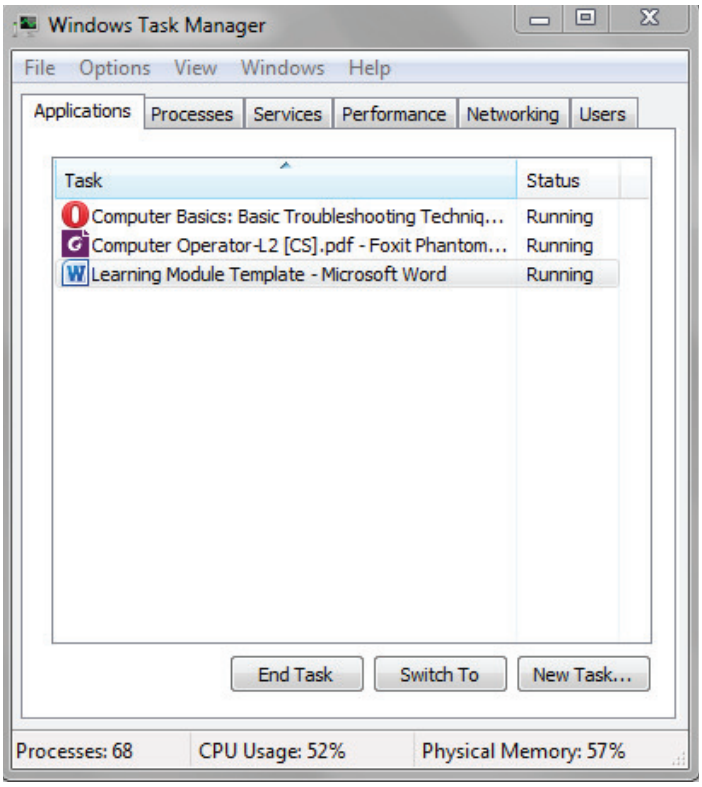
Problem: An application is running slowly:

Solution 1: Close and reopen the application.
Solution 2: Update the application. To do this, click the **Help** menu and look for an option to check for **Updates**. If don't find this option, another idea is to run an online search for application updates.

Problem: An application is hang:

Sometimes an application may become **frozen**. When this happens, you won't be able to close the window or click any buttons within the application.

Solution 1: Force quit the application. On a computer, Press (and hold) Ctrl+Alt+Delete on keyboard to open the Task Manager.
Select the unresponsive application and click **End task**



Learning Activity:

1) Write the steps you will take if a program on a computer is completely unresponsive.
2) Write your last initiative to resolve the issue if you've tried everything and the problem still isn't fixed.
3) Write the difference between System testing and structural testing?
4) Set windows Help to troubleshoot the software errors and write the steps you have followed in troubleshooting?

1.4. Health, Safety and Security procedures to ensure safe working environment.

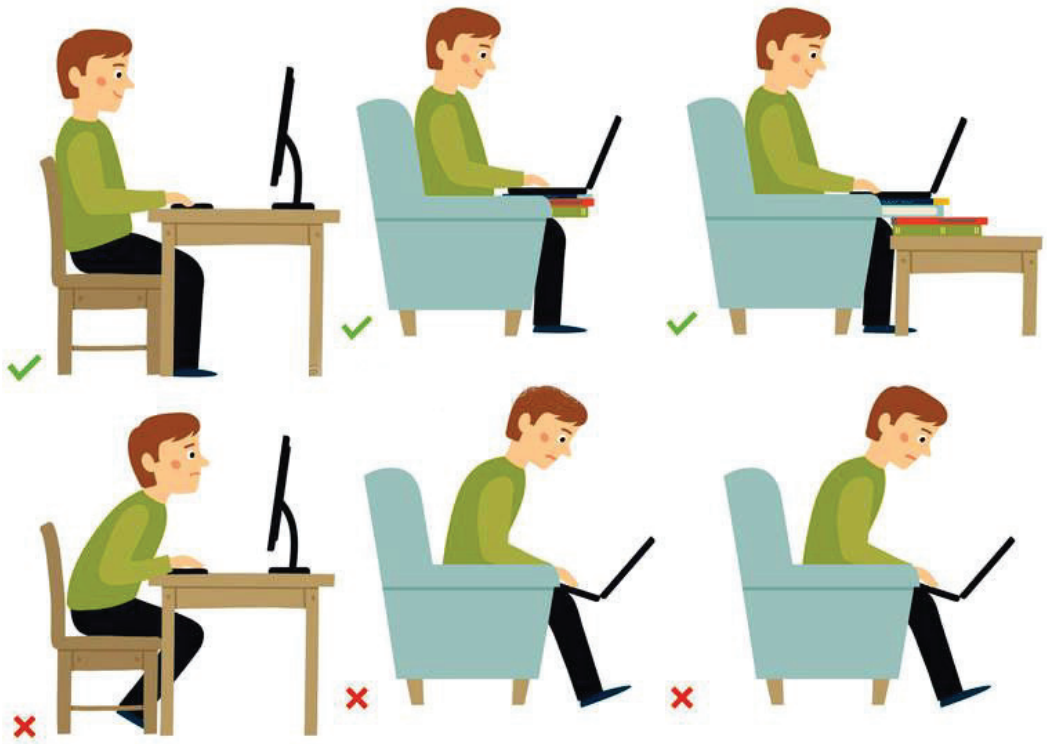
Safety, health and security in the workplace is important to workers and to the general morale of the employees of a company. Much of this is common sense, but there are government agencies and regulations that govern this aspect of running a business in order to ensure the health and safety of the workforce.

1.4.1. Working in Computer Labs.

When Computer Lab is set up, many things are considered for its setup so that the computer user may work easily and effectively and the computers may also work in recommended situation. The things which are considered in the setup of computer lab are as under.

- **The Number of Computers**
  First of all, it is necessary to know how many computers will be installed in the computer lab and what will be their accessories? So that, we have may prepare computer tables accordingly.

- **Sitting Arrangement**
  A Computer table must have such a space so that the computers as well as its accessories may be placed easily. The design of the computer table would be such as the system unit may be placed in the airy space it can be opened and closed very easily and it should be of appropriate size. The chair should be revolving so that the user may move easily. Furniture of the lab should be short so that atmosphere of that should look spacious and airy.



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- **Lab Temperature**

  It is very important for the setup of computer lab, so that the user and computer may work more effectively and efficiently. According to our atmospheres, the temperature should be 25C to 30C.

- **Power Management**

  A Computer consumes energy according to its type. We must install and check on daily bases these devices for safety.

  i. Uninterruptable Power Supply (UPS)
  ii. Wiring
  iii. Electric Safety
  iv. Short Circuit Breaker
  v. Power Plug
  vi. Earth Ground

Learning Unit 2:

Create a Document using MS Word

Objective:

In this learning unit you will learn how to open and save file with desired name and location in MS Word and how you can type in the document. After completion of this learning unit you will be able to type speedily and error free in MS Word.

After completion of this Learning Unit you will be able to:

- ❖ Compose a document as per the requirements.
- ❖ Assign name and location to save a file in word file format.
- ❖ Format word document according to given requirements.
- ❖ Generate hard copy according to job requirements.

2. MS-word

MS Word 2010 Microsoft Word is part of the Microsoft Office. Its main function is for producing documents that includes text, graphics, table, clip art, etc. The most familiar application among the members of the Office is MSWord.

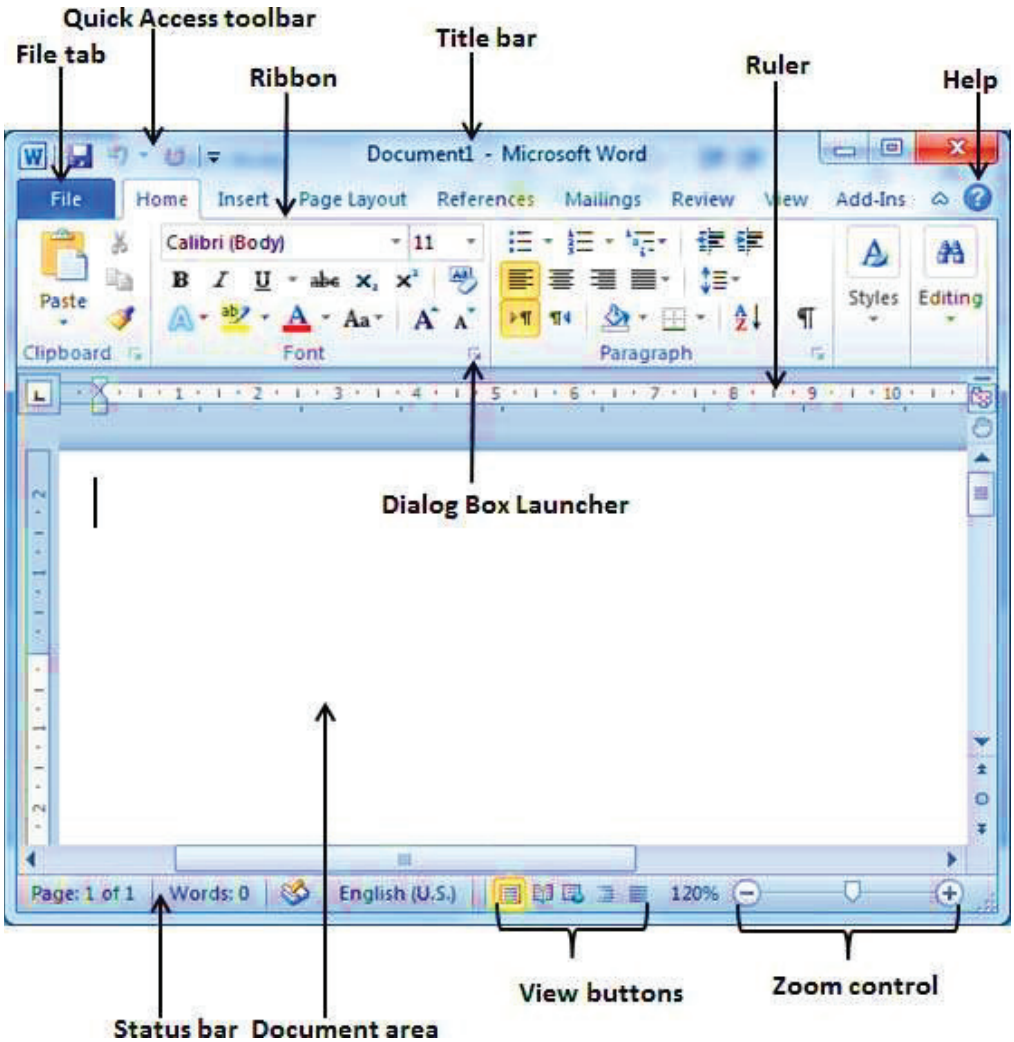
Do you know!

By Default, MS Word Document open with the name "Document1".

Features of Standard Word Processor

- **File Management:**
  Many word processors contain file management capabilities that allow you to create, delete, move, and search for files.

- **Font specifications:**
  Allows you to change fonts within a document. For example, you can specify bold, italics, and underlining. Most word processors also let you change the font size and even the typeface



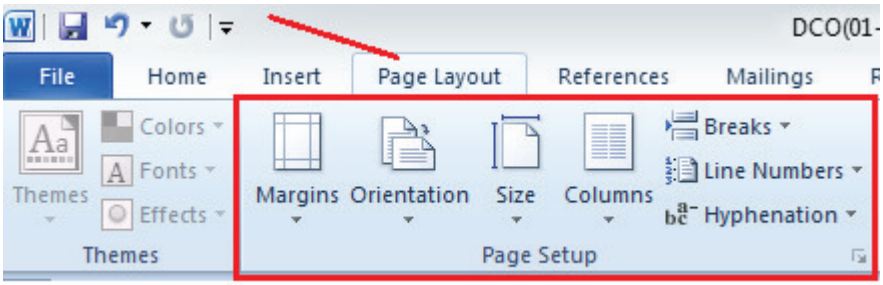
2.1. Compose Documents as per the requirements.

2.1.1. Formatting and modify documents.

Do You Know?

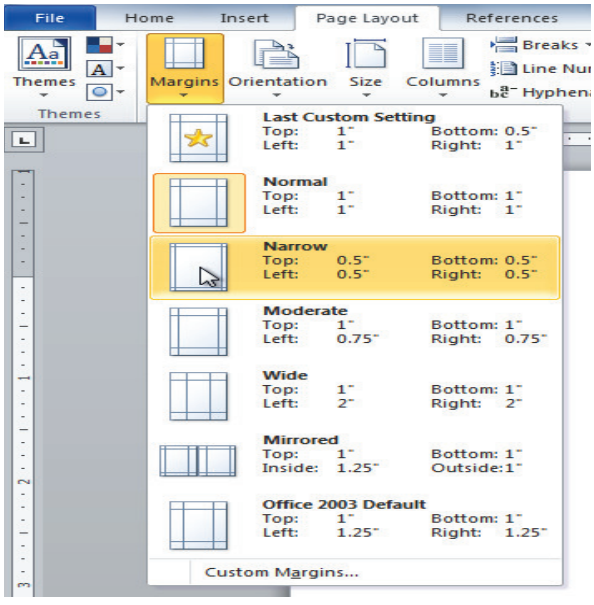
In MS Word default paper size is US Letter (8.5”x11”) or A4 (8.27”x11.69”)

- **Page Layout**
  To setup a page in MS Word a **Page Layout** tab is available in the Tabs. In page Layout tab a group is available for the page setup as shown in picture below:

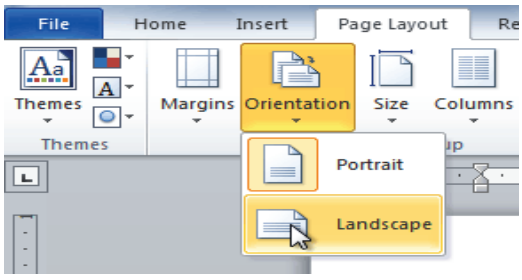


In Page Set-up group the following options can be set:

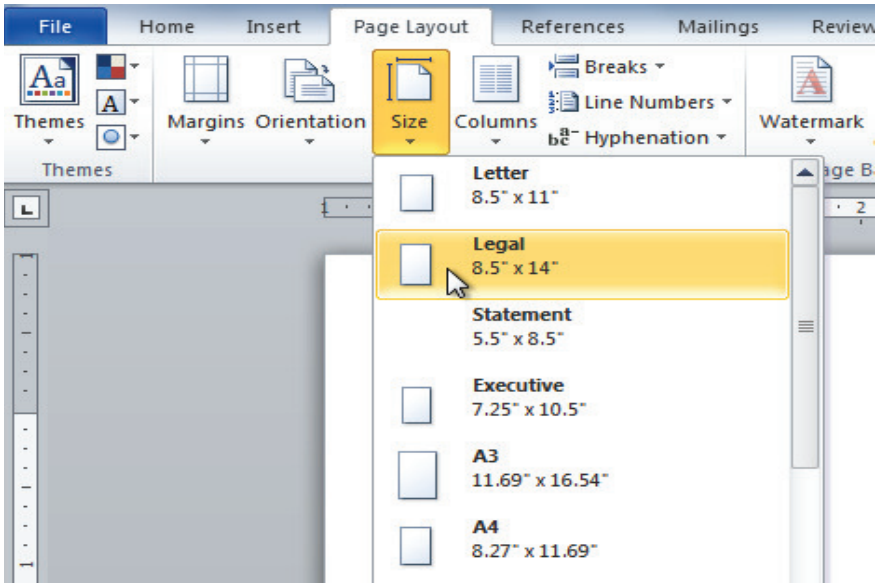
- **Margin:**
  A Margin is the space between the text and the edge of your document.



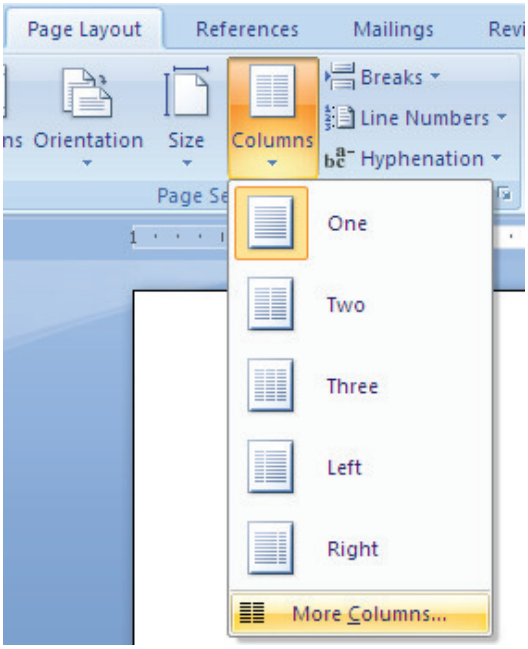
- **Orientation:**
  Paper on which text is printed could have two orientations – portrait and landscape. In portrait orientation, height of the paper is larger than its width whereas in landscape orientation, the width is larger than the height



- **Size:**
  Books and magazines are printed in a variety of sizes. Different sizes of paper are required to set the requirement of printing. Microsoft Word allows you to choose a variety of paper sizes for your documents. MS Word offers a large menu of standard paper sizes to choose from and also allows setting of a custom paper size of your own.



- **Columns**
  Columns are used in many types of documents, but most commonly used in newspapers, magazines, academic journals, and newsletters. **Columns** can improve document's organization and increase its readability. They also allow you to utilize all of the available space on the page.



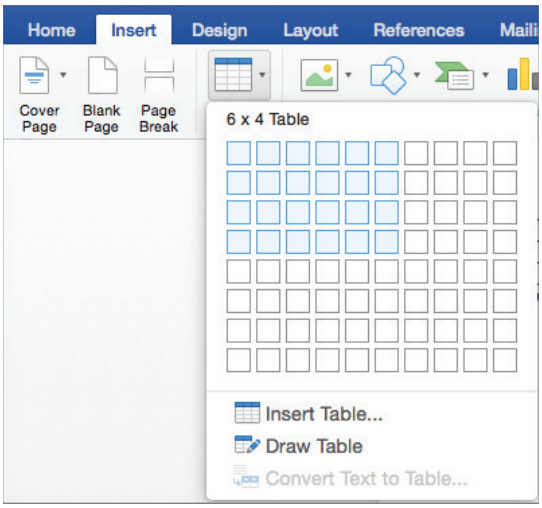
- **Hyphenation:**
  In word processing, hyphenation refers to splitting a word that would otherwise extend beyond the right margin.

Remember:
Hyphens that you add explicitly by entering the dash character are called hard *hyphens*.

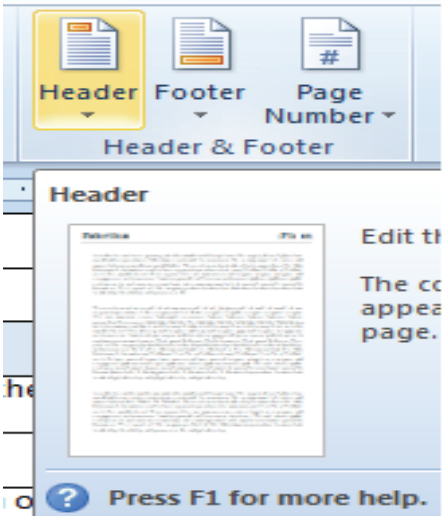
- **Inserting Table:**
  A **table** is a grid of cells arranged in **rows** and **columns**. Tables can be customized and are useful for various tasks such as presenting text information and numerical data.

  Inserting a blank table:
  The procedure to insert a blank table in MS Word has following steps:

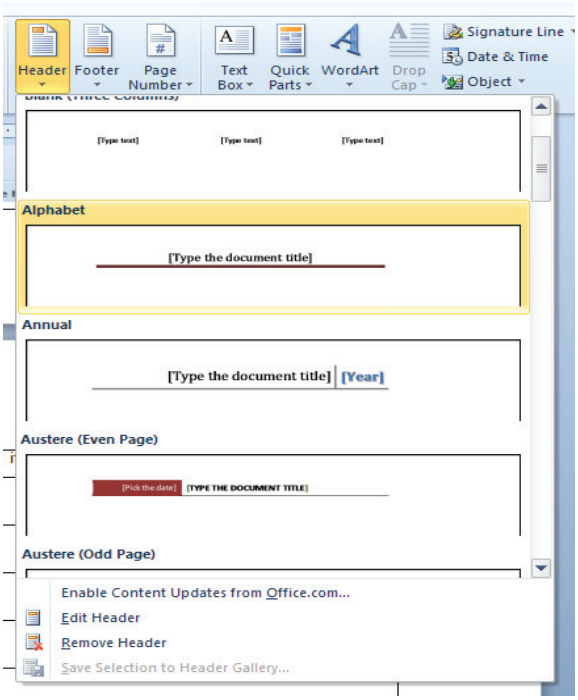
  i. Place your insertion point in the document where you want the table to appear.
  ii. Select the insert tab.
  iii. Click the table command.



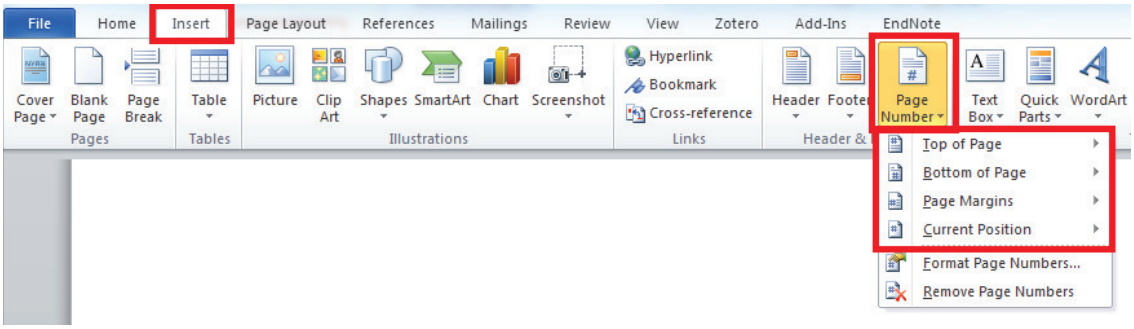
- **Procedure of Inserting Header and footer:**
  To set up a header and footer for your document, click on the insert tab at the top of Word. Now locate the Header & Footer panel:



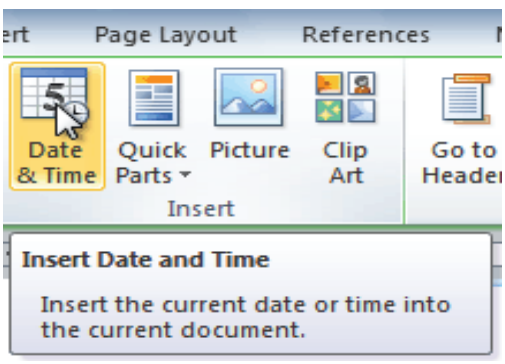
Click on the Header item and you'll see a drop down list appear:



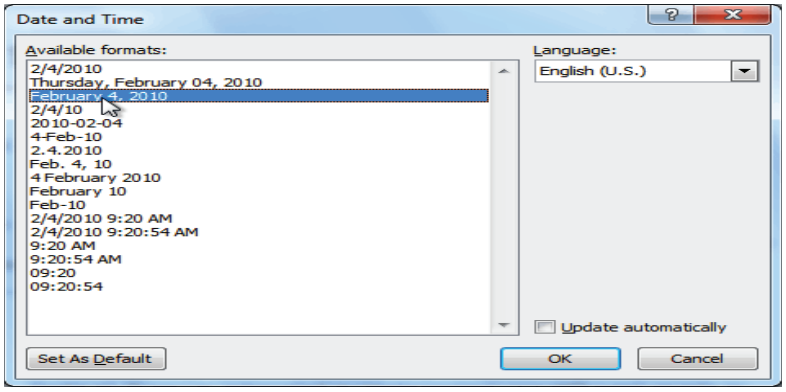
- **Page Numbering**
  We can attach page number in every page or in footer.



1) From the **Design** tab, click the **Date & Time** command.

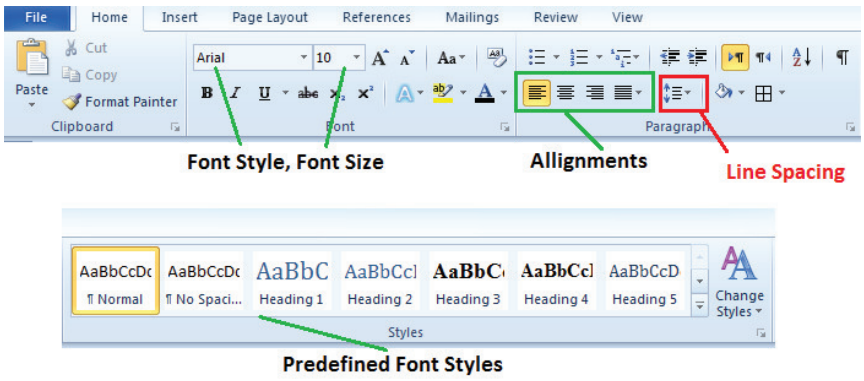


2) Select a **date format** in the dialog box that appears.



- **Alignment**

  In Word, there are several options for adjusting the font of text, including size, color, and inserting special symbols. You can also adjust the alignment of the text to change how it is displayed on the page. The text formatting toolbar is given below with the options related to text formatting.

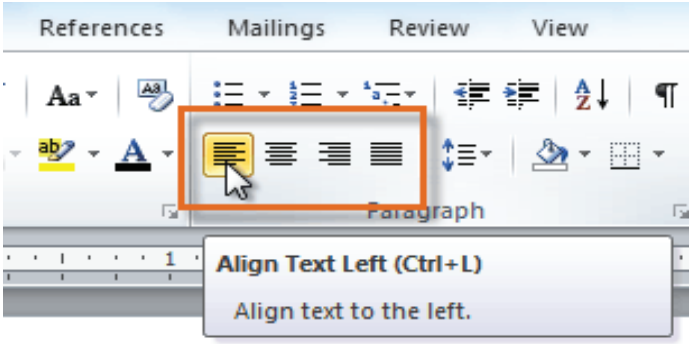


Do you know!

The selected Table is converted into Text. Each row gets converted into a paragraph. The text in each cell of the row gets separated by tabs.

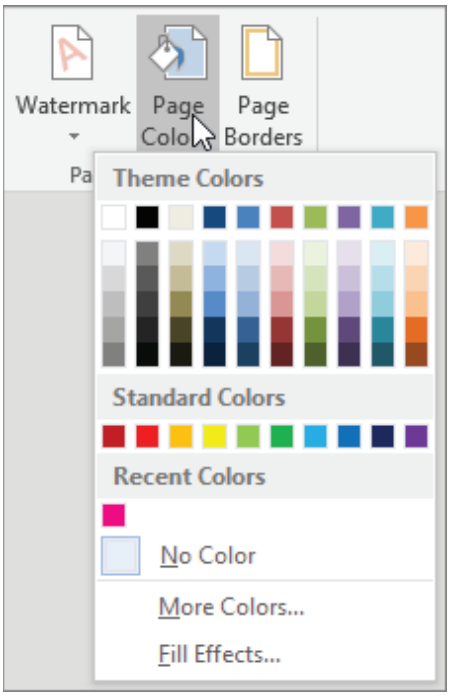
Basic Four allignments

i. **Left:** Aligns all selected text to the left margin
ii. **Center:** Aligns text an equal distance from the left and right margins
iii. **Right:** Aligns all selected text to the right margin
iv. **Justify:** Aligns text equally on both sides and lines up equally to the right and left

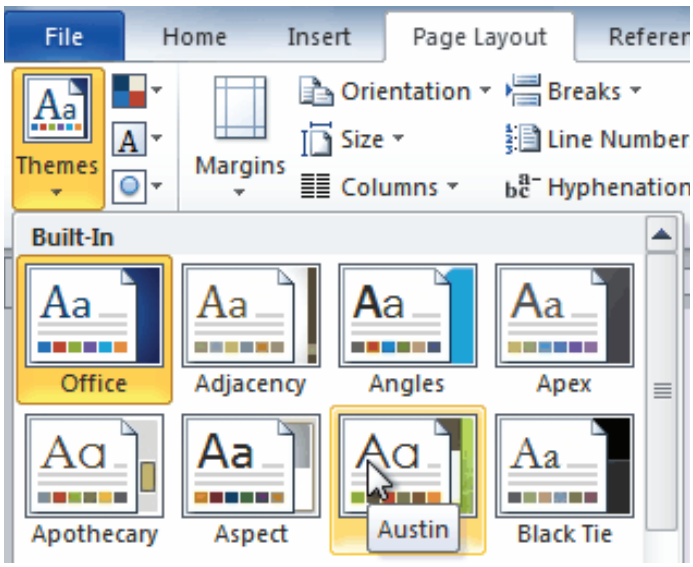


- **Change the background color**

  i. Click Design > Page Color.
  ii. Click the color you want under Theme Colors or Standard Colors

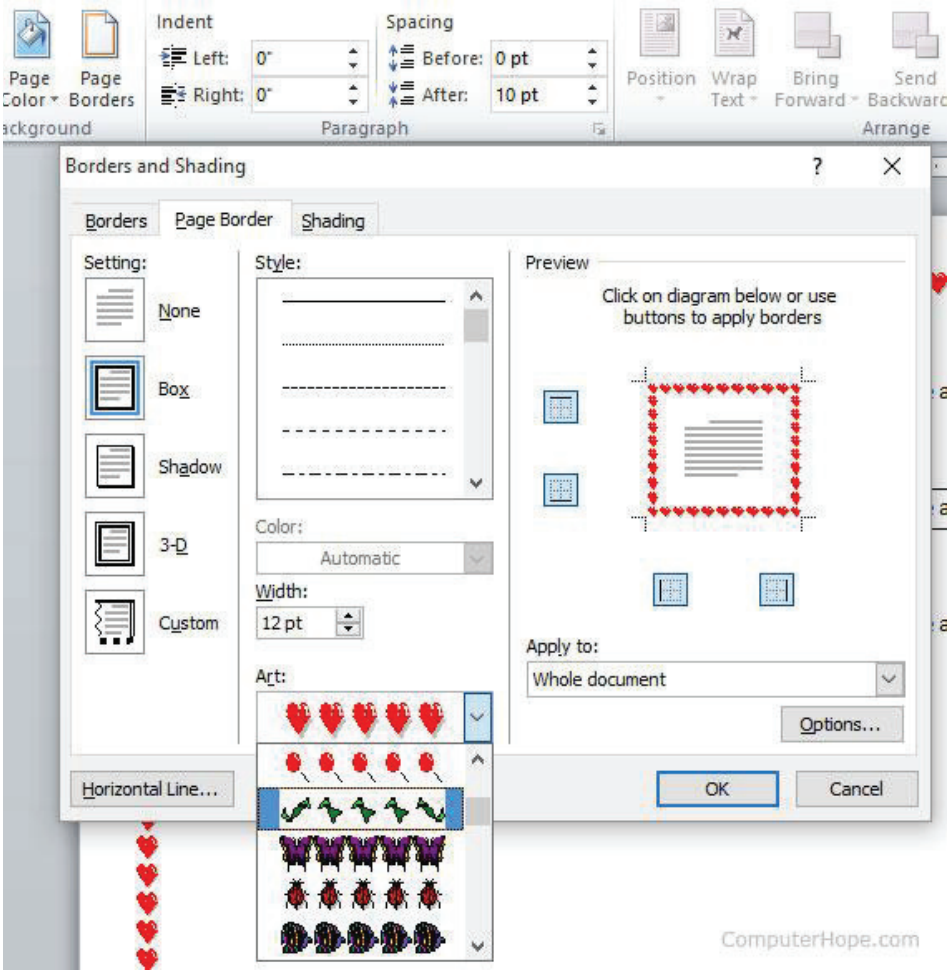


- **Themes/Style**
  Styles and themes are powerful tools in Word that can help you easily create professional-looking documents. A **style** is a predefined combination of font style, color, and size of text that can be **applied to selected text**. A **theme** is a set of formatting choices that can be applied to an **entire document** and includes theme colors, fonts, and effects.



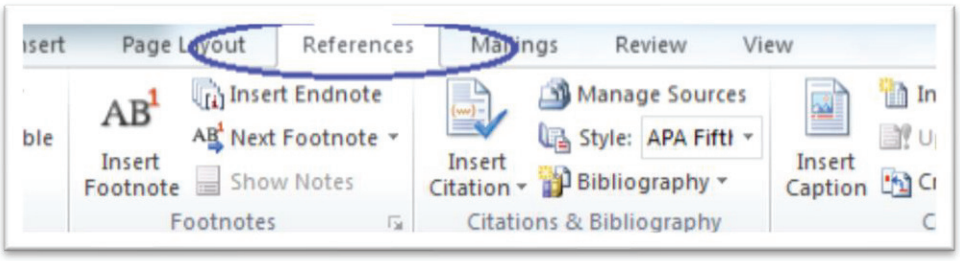
- **Page / Paragraph borders**
  Microsoft Word gives you hundreds of page border options that allows you to surround a page with a clean or fancy border. Follow the steps below to insert a border in your Microsoft Word document

  i. Open Microsoft Word.
  ii. Click on the Page Layout tab. In Word 2013 and 2016 click on the Design tab instead.
  iii. In the Page Background group, click the Page border option.
  iv. In the Borders and Shading window (shown below), click the Page Border tab.
  v. Select Box if you want a square border around your page.
  vi. Select the Style of border you want on the page, which can be solid, dotted, or dashed. Select the Color and Width of the border. If you want to select artwork to use as the border, click the down arrow for the Art drop-down list. In the example below, we're using the hearts art as a border

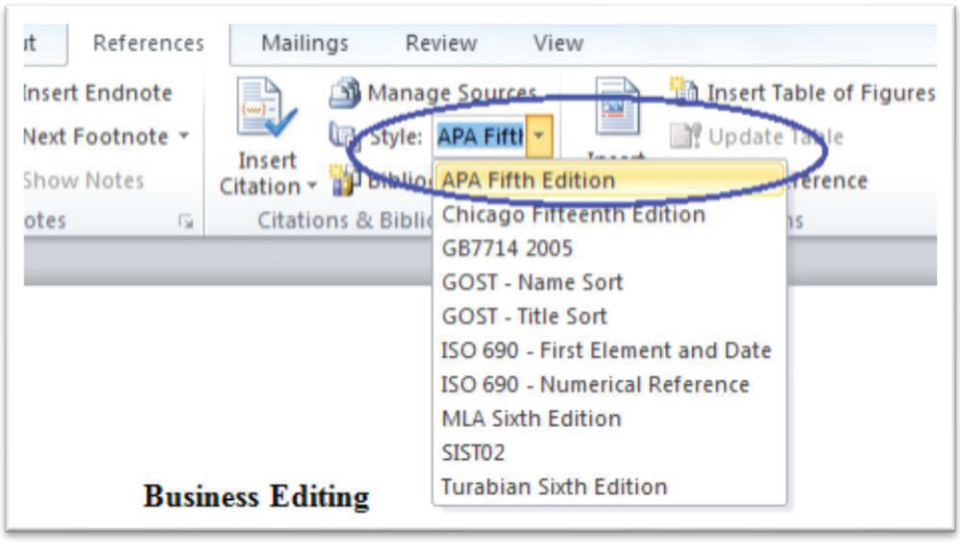


- **References**
  To insert a bibliography using the Bibliography tool, you must first enter references and sources, which can be done simultaneously.

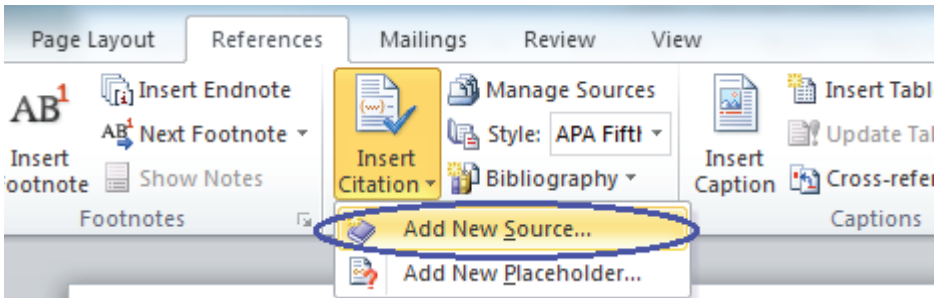
i. **Step 1:**
Open your document in Microsoft Word 2010 and click on the **References** tab.



ii. **Step 2:**
Place your cursor where you would like the citation inserted. Select your style of references in the **Style** menu, shown in the screenshot below

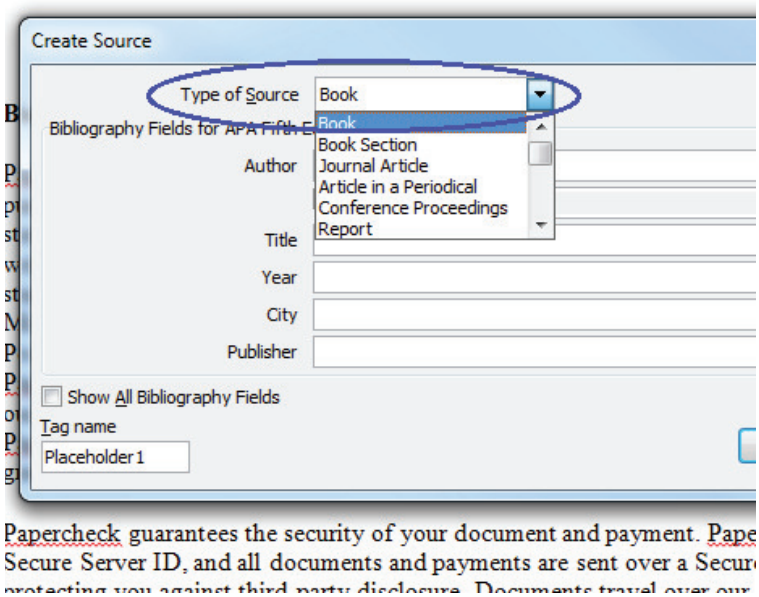


iii. **Step** *3:*
In the screenshot below, APA Fifth Edition is shown in the Style menu. Click on the Insert Citation button to produce the drop-down menu shown below, and select Add New Source.



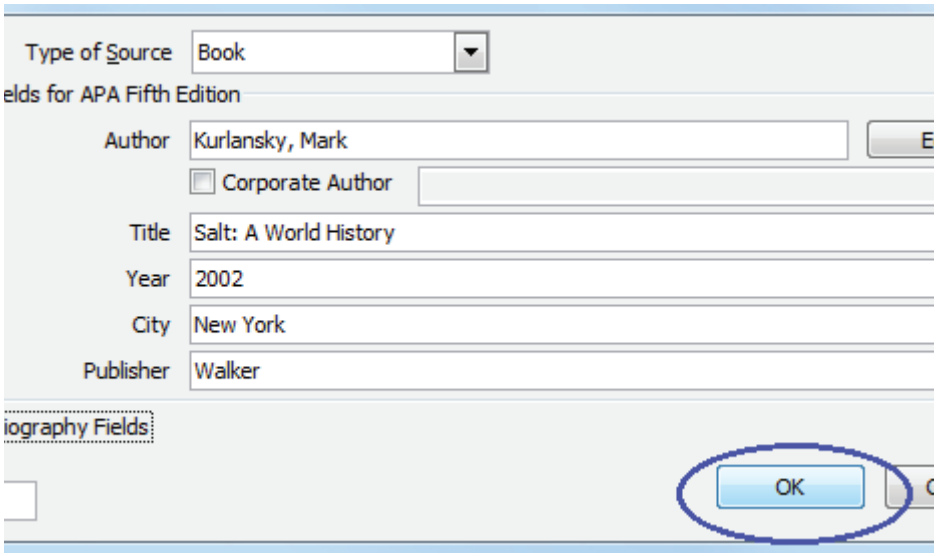
iv. **Step 4:**

A Create Source window will appear. Choose the source type from the drop-down menu.



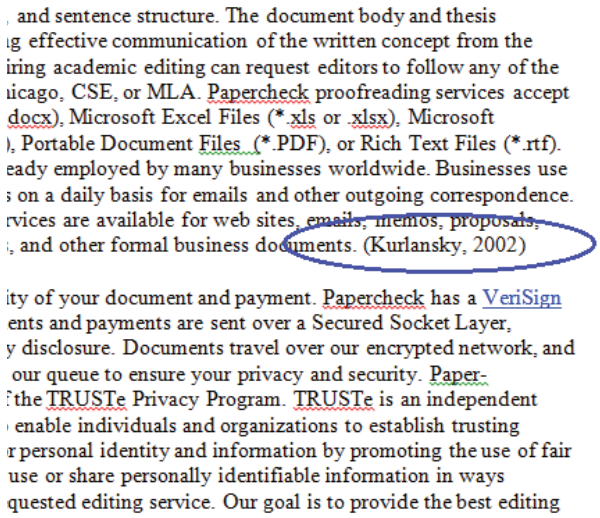
v. **Step 5:**

Enter the source information in the fields provided and click **OK**.



vi. **Step 6:**

In the screenshot below, note that a reference has been entered. Follow Steps 2–5 to insert your remaining references.



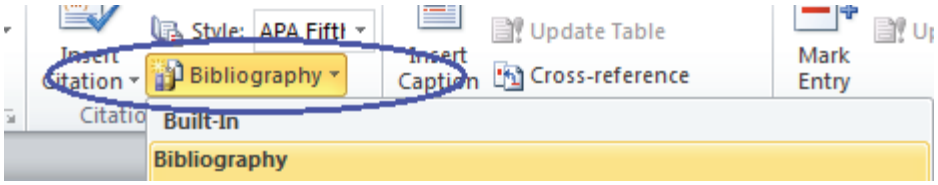
, and sentence structure. The document body and thesis
ıg effective communication of the written concept from the
iring academic editing can request editors to follow any of the
ıicago, CSE, or MLA. Papercheck proofreading services accept
docx), Microsoft Excel Files (*.xls or .xlsx), Microsoft
), Portable Document Files (*.PDF), or Rich Text Files (*.rtf).
eady employed by many businesses worldwide. Businesses use
s on a daily basis for emails and other outgoing correspondence.
rvices are available for web sites, emails, memos, proposals,
, and other formal business documents. (Kurlansky, 2002)

ity of your document and payment. Papercheck has a VeriSign
ents and payments are sent over a Secured Socket Layer,
y disclosure. Documents travel over our encrypted network, and
our queue to ensure your privacy and security. Paper-
the TRUSTe Privacy Program. TRUSTe is an independent
enable individuals and organizations to establish trusting
r personal identity and information by promoting the use of fair
use or share personally identifiable information in ways
quested editing service. Our goal is to provide the best editing

vii. **Step 7:**

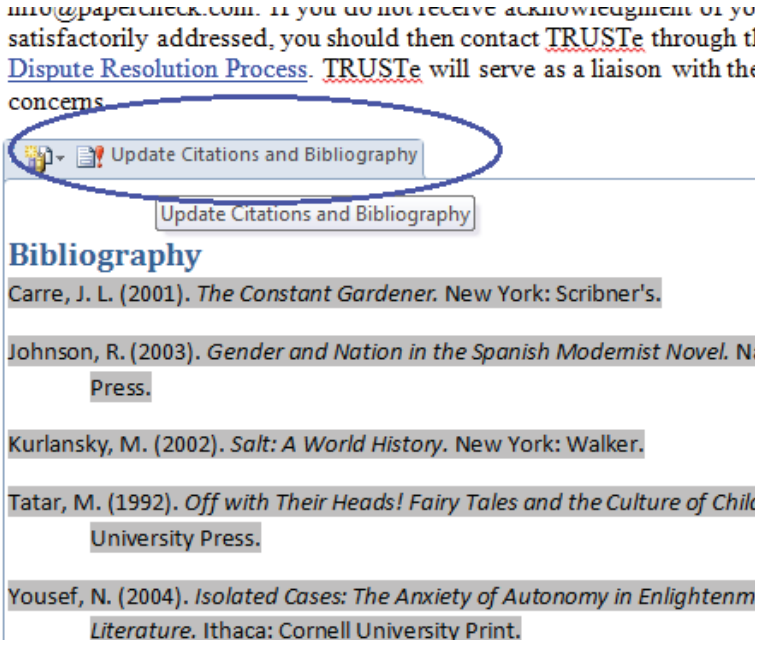
Once you have entered all references and sources, place your cursor at the end of your document. The bibliography will be inserted wherever *you place the cursor.*

Click on the **Bibliography** button, shown below, and select either **Bibliography** or **Works Cited**.

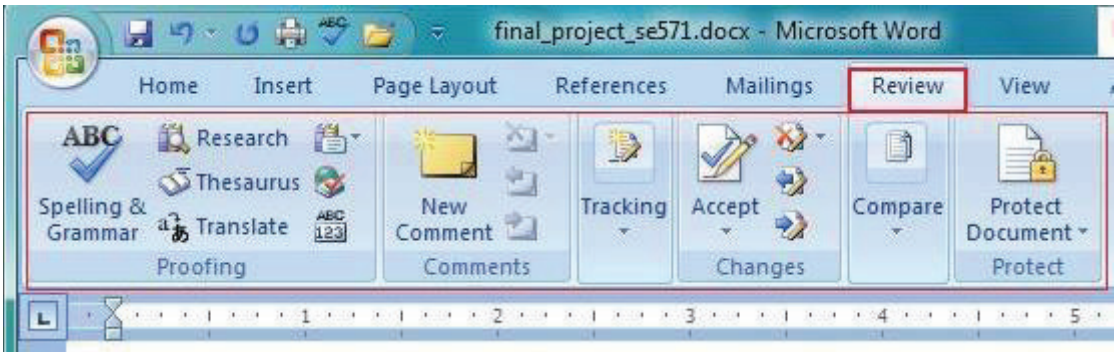


viii. **step 8:**

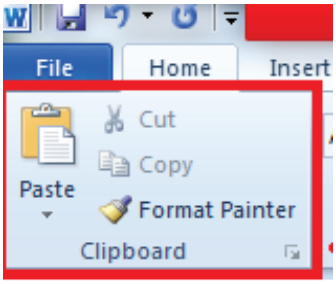
To update the bibliography after entering new sources, click anywhere on the bibliography table. Click on **Update Citations and Bibliography**.



- **Review option**
  There are different group in Review group, proofing (in proofing check spelling & grammar checking), Comments (add comments), Changing (changing the words), and protect documents.



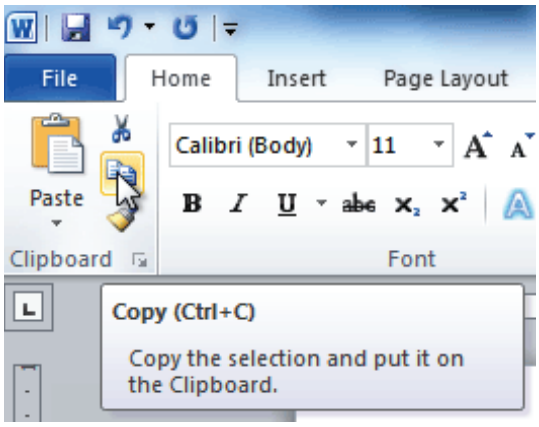
- **Editing tools (Cut/copy/paste, Undo/redo, Delete/insert**
  Edit menu cannot be find in the Ribbon in MS 2010, because all the toolbars and menus are redesigned and relocated in it. For example, the **Select** function stays in the **Editing** group of **Home** tab; the **Paste** function stays in the **Clipboard** group of **Home** tab



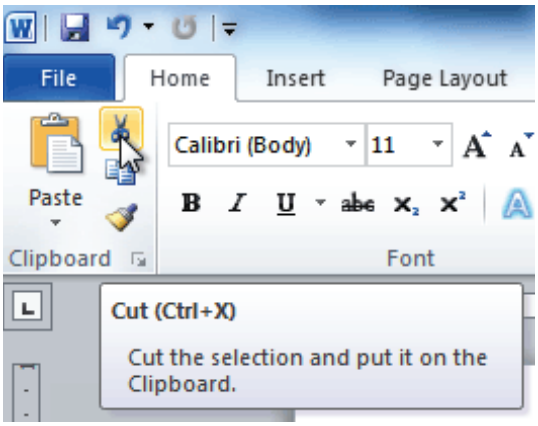
Cut: Removes the selection from the active document and places it on the clipboard. Short Key of Cut command is CTRL+X.
Copy: Copies the selected text to the clip board
Paste: Paste the contents of the clipboard at the insertion point (cursor) or whatever is selected.
Clear: Deletes the selected object or text, but does not place it on the clipboard.
Select All: Selects all text and graphics in the active window.
Find: Searches for specified text in the active document.
Replace: Searches for and replaces specified text and formatting.

- **Copying and Pasting Text**
  The procedure to Copy and paste the text has following steps:

  i. **Select the text you want to copy.**
  ii. **Click the** Copy **command on the** Home **tab. You can also right-click your document and select** Copy
  iii. Place your insertion point where you want the text to appear.

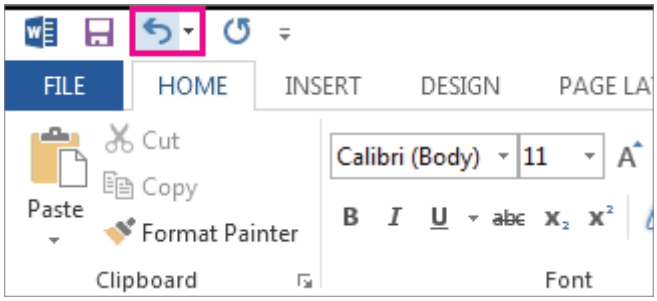


- **Cutting and Pasting Text**
  i. Select the text you want to copy.
  ii. Click the **Cut** command on the **Home** tab. You can also right-click the document and select **Cut**.



- **Undo**
  Repeat the last action it can found quick access toolbar. The Undo command is activated by pressing the Ctrl+Z

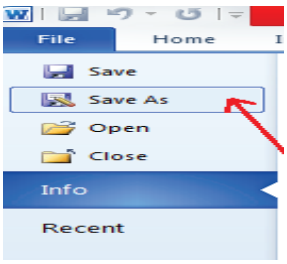
- **Redo**
  To do last one step Ctrl+Y

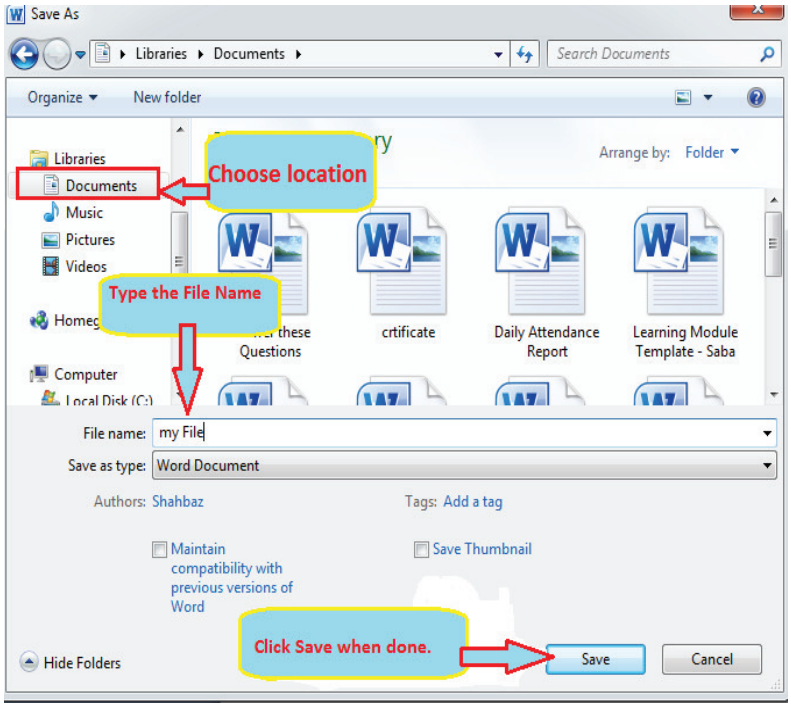


- **One drive location**
  Save As function allows you to choose a name and location for your document. It's useful if you've first created a document or if you want to save with different name while keeping the original document.

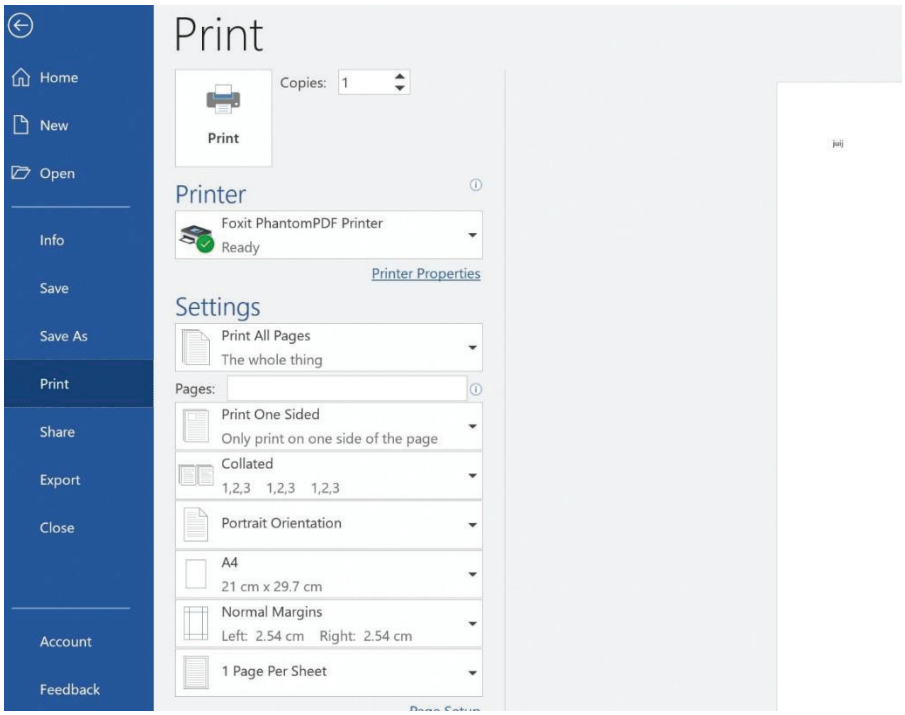
  The procedure to save a word file through Save As function has the following steps:

  i. Open the word File
  ii. Click the **File** tab.
  iii. Select **Save As**.
  iv. The Save As dialog box will appear. Select the location where you want to save the document




Save As
Libraries ▸ Documents ▸
Search Documents
Organize
New folder
Libraries
Documents
Music
Pictures
Videos
Choose location
Type the File Name
Arrange by: Folder
Daily Attendance Report
Learning Module Template - Saba
Computer
File name: my File
Save as type: Word Document
Authors: Shahbaz
Tags: Add a tag
Maintain compatibility with previous versions of Word
Save Thumbnail
Click Save when done.
Hide Folders
Save
Cancel

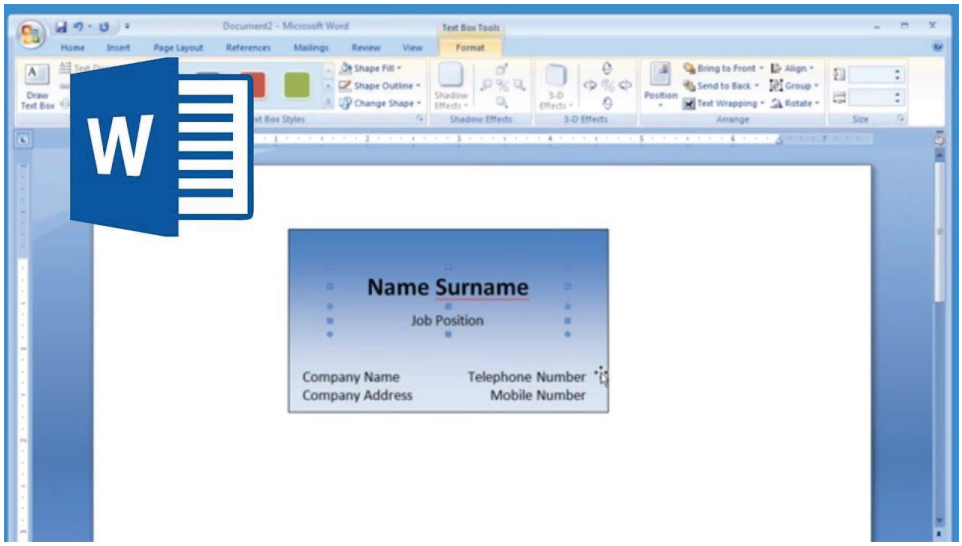
- **Print Document:**
  - **i.** Select document for print **(Type Ctrl+P)**
  - **ii.** Select/Chose Printer
  - **iii.** Select Page Orientation
  - **iv.** Select Page size



Practice-1

Create Business Cards using Shapes, text, colors and take a print.

i. Go to inset tab and select the shape group.
ii. Select rectangular shape
iii. Choose color according to their choice.
iv. Type text and contents information.



Practice-2

Create Resume with the following requirement

i. Name of Candidate must be in center with “Capitalize each word” case.
ii. First heading size = 16 pt.
iii. 2nd Heading size= 14 pt.
iv. Insert Picture to left top corner
v. Font family = Calibri.
vi. Apply water mark
vii. Take a print of the Resume.

FIRST NAME **LAST NAME**

Address · Phone
Email · LinkedIn Profile · Twitter/Blog/Portfolio

To replace this text with your own, just click it and start typing. Briefly state your career objective, or summarize what makes you stand out. Use language from the job description as keywords.

EXPERIENCE

DATES FROM – TO
JOB TITLE, COMPANY
Describe your responsibilities and achievements in terms of impact and results. Use examples, but keep it short.

DATES FROM – TO
JOB TITLE, COMPANY
Describe your responsibilities and achievements in terms of impact and results. Use examples, but keep it short.

EDUCATION

MONTH YEAR
DEGREE TITLE, SCHOOL
It's okay to brag about your GPA, awards, and honors. Feel free to summarize your coursework too.

MONTH YEAR
DEGREE TITLE, SCHOOL
It's okay to brag about your GPA, awards, and honors. Feel free to summarize your coursework too.

SKILLS

- List your strengths relevant for the role you're applying for
- List one of your strengths
- List one of your strengths
- List one of your strengths
- List one of your strengths

ACTIVITIES

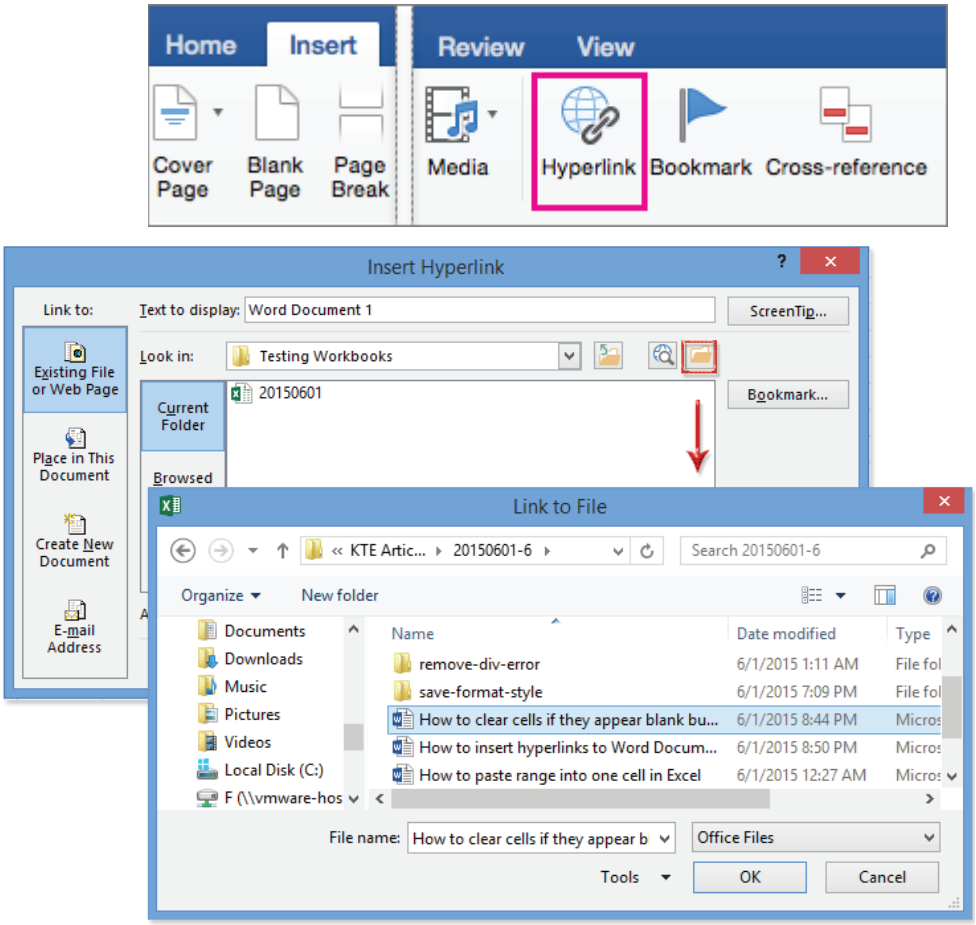
Use this section to highlight your relevant passions, activities, and how you like to give back. It's good to include Leadership and volunteer experiences here. Or show off important extras like publications, certifications, languages and more.

Practice-3

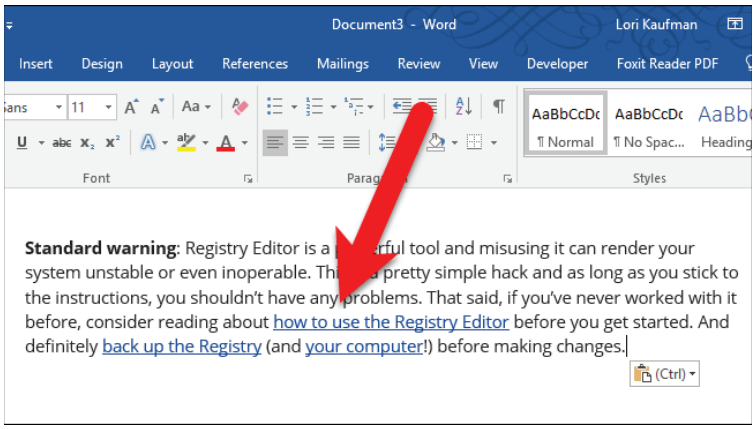
Practice hyperlink and create links between word document texts

.

i. Select the text or picture to use as a link, and then click Insert > Hyperlink**.**



ii. Click OK**.**



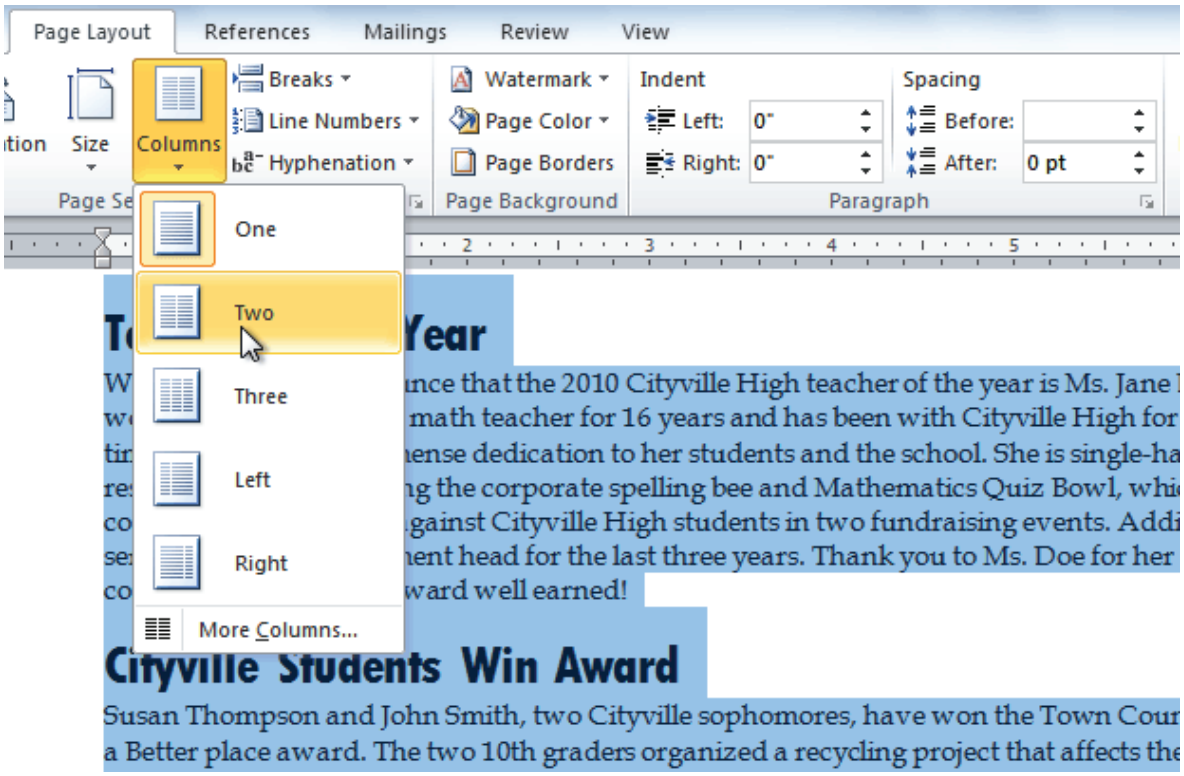
iii. After applying hyperlink show above image result

iv. To go any hyperlink attachment **(CTRL+ Left click)**

Practice-4

Take a double column newspaper and create similar paragraph style in the word document.

i. Select the document
ii. Go to layout tab and select number of columns.



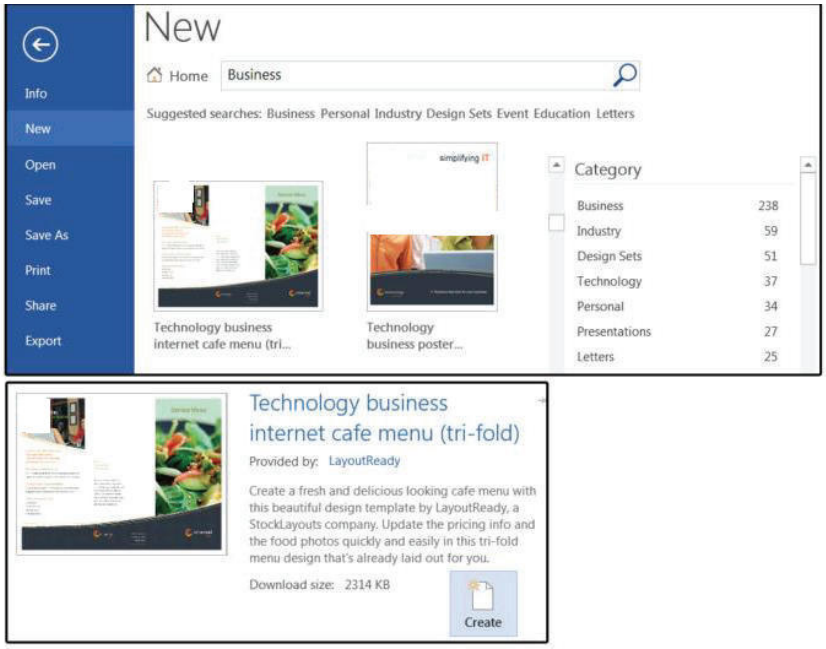
Practice-5

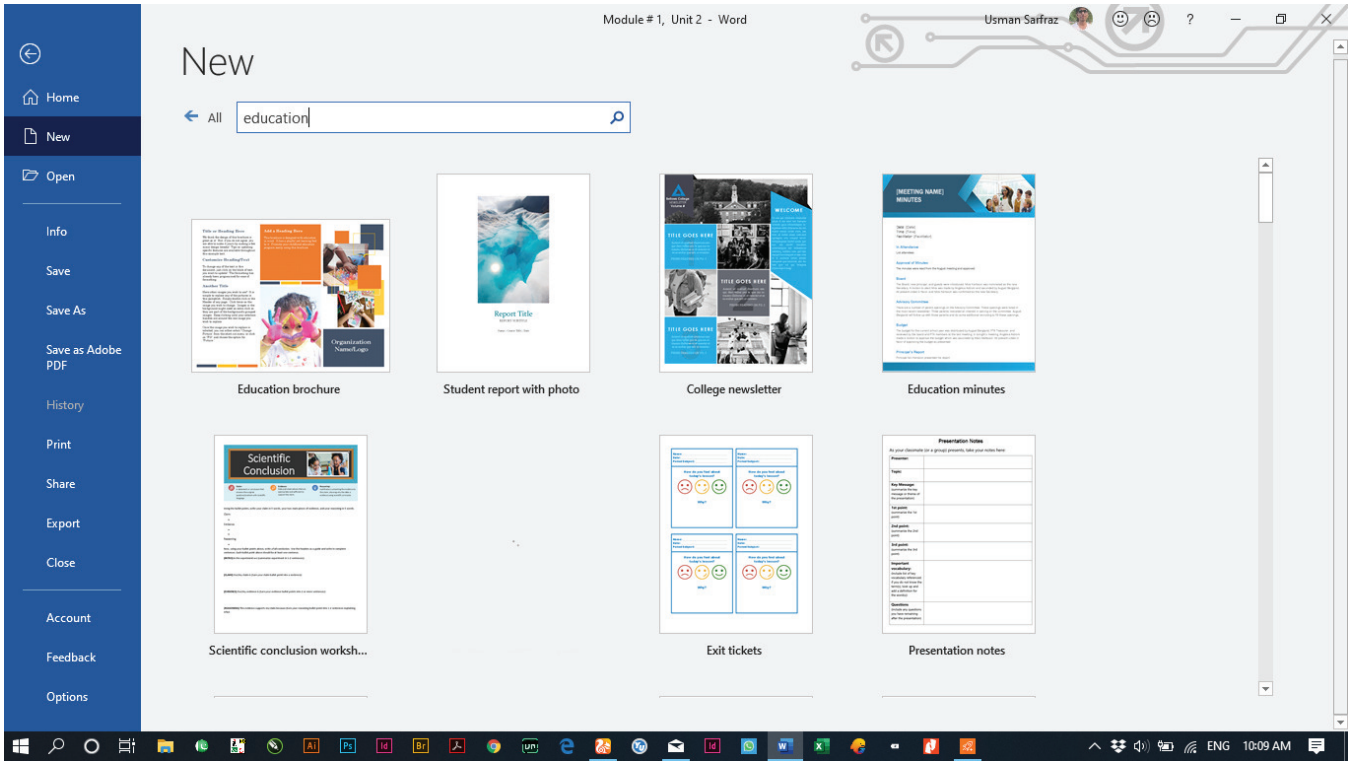
Download the Educational template in Microsoft Word from Internet and edit those templates with your content.

How to access Microsoft Word's stock templates

Fortunately for us, Microsoft provides many hundreds of templates for all of its programs. Note that most of Microsoft's templates are online, which means you cannot access them unless you're connected to the internet. To open one of the system-provided templates in Word:

i. Open Microsoft Word and select New.
ii. Persue the Suggested Search categories: Business, Personal, Industry, Design Sets, Events, Education, or Letters. For this exercise, select Business.
iii. Word displays a message that says, "Searching thousands of online templates."
iv. Word displays template search results on-screen, plus a comprehensive list of categories in a scrolling panel on the right.
v. Scroll down the page or choose a different category, then select a template that fits your current project.


New
Info
New
Open
Save
Save As
Print
Share
Export
Home
Business
Suggested searches: Business Personal Industry Design Sets Event Education Letters
Technology business internet cafe menu (tri...
Technology business poster...
Category
Business 238
Industry 59
Design Sets 51
Technology 37
Personal 34
Presentations 27
Letters 25
Technology business internet cafe menu (tri-fold)
Provided by: LayoutReady
Create a fresh and delicious looking cafe menu with this beautiful design template by LayoutReady, a StockLayouts company. Update the pricing info and the food photos quickly and easily in this tri-fold menu design that's already laid out for you.
Download size: 2314 KB
Create


Module # 1, Unit 2 - Word
Usman Sarfraz
New
Home
New
Open
Info
Save
Save As
Save as Adobe PDF
History
Print
Share
Export
Close
Account
Feedback
Options
All
education
Education brochure
Student report with photo
College newsletter
Education minutes
Scientific conclusion worksh...
Exit tickets
Presentation notes
ENG
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Learning Unit 3:
Preparer a Worksheet using MS Excel

Objective:

This learning unit covers the procedure for creating workbook and spreadsheet, the basic concept of spreadsheets, types of spreadsheets in Excel and procedure for creating workbook in Excel. After completion of this learning unit you will be able to explain the types and uses of worksheets and the procedure of creating a worksheet.

After completion of this Learning Unit you will be able to:

- ❖ Develop a worksheet as per given data.
- ❖ Format the worksheet according to given job requirement.
- ❖ Apply formula according to given criteria.
- ❖ Generate Charts / Graphs according to the given data and security procedures to ensure safe working environment.

3. MS-Excel

Microsoft Excel 2010 is an excellent program for organizing, formatting, and calculating numeric data. Excel displays data in a row-and-column format, with gridlines between the rows and columns, similar to accounting ledger books or graph paper. MS Excel 2010 includes the Microsoft Office Fluent interface, which consists of a customizable visual system of tools and commands.

Remember

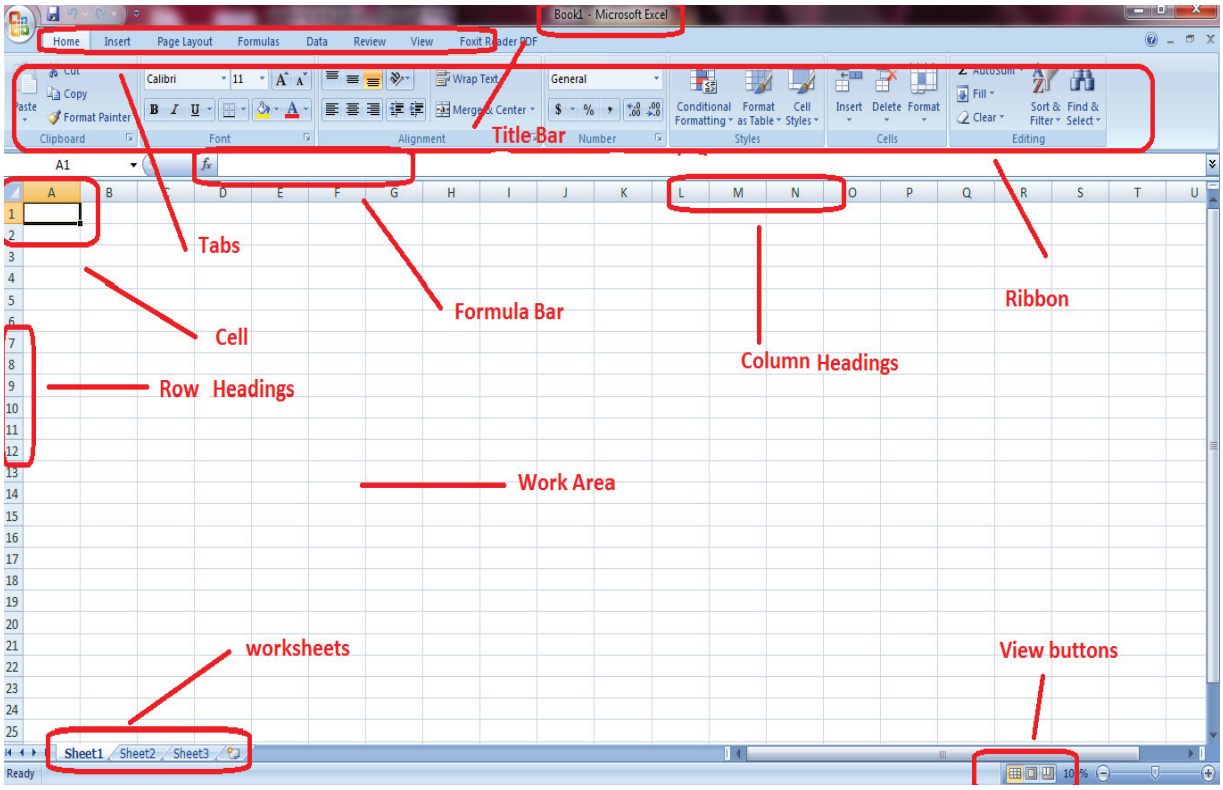
Every workbook in MS Excel contains 3 worksheets by default.

3.1. Develop Worksheet

Worksheets Microsoft Excel consists of worksheets. Each worksheet contains columns and rows. The columns are lettered A to Z and then continuing with AA, AB, AC and so on to XFD (16384); the rows are numbered 1 to 1,048,576

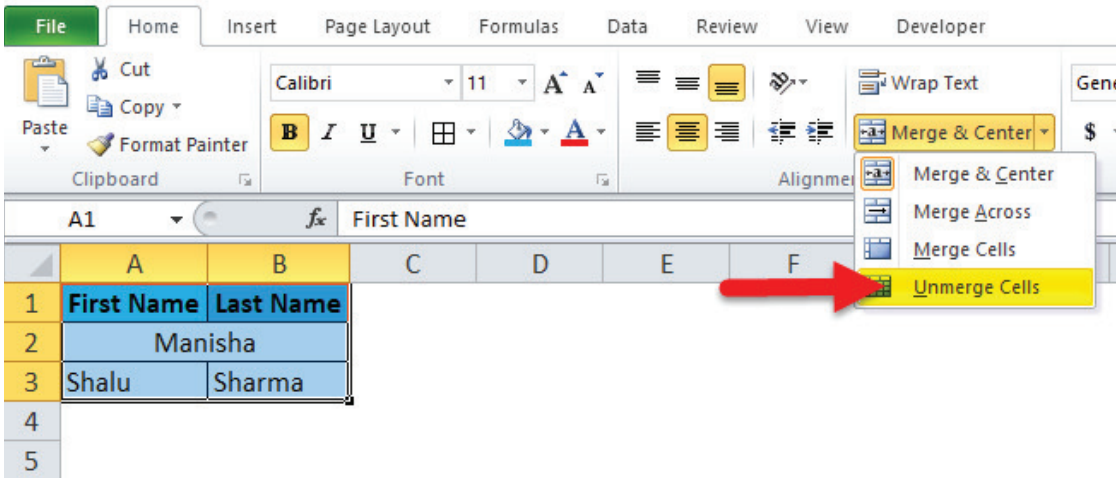
- **THE INTERFACE:**
  Cell: The intersection of a column and a row. Information is stored in cells.
  Cell Reference: Address, consisting of a column and a row IDs of a specific cell.
  Column: A vertical group of cells. Total no of columns is 16,384.
  Formula: A self-made method of calculation is called formula.
  Function: A pre-defined method of calculation is called function.
  Range: A group of cells.
  Row: A horizontal group of cells
  Value: A number that can be used in an Excel calculation.
  Workbook: A collection of worksheets contained within a single file

Main parts of Spreadsheet Work Area

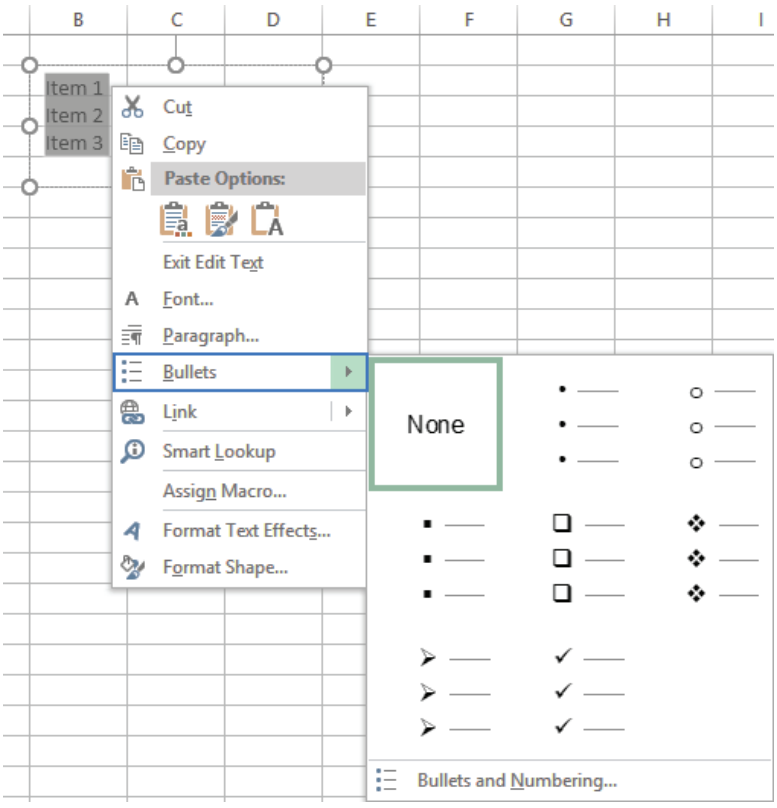


3.1.1. Format Cells to Prepare the Worksheet.

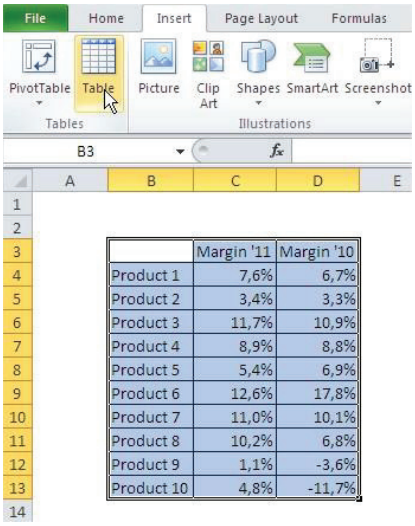
- **Merge and Unmerge**
  This document explains how to merge cells within all versions of Microsoft Excel. Merging cells is often used when a title is to be centered over a particular section of a spreadsheet. When a group of cells is merged, only the text in the upper-leftmost box is preserved.



- **Numbering and Bullets**
  Numbering and bullets are used to highlight any point in a manner. There are many types of bullets and numbering.



- **Tables:**
  A table in Excel is a block of cells containing related data that have been formatted as a table. Table can be inserted from insert tab.



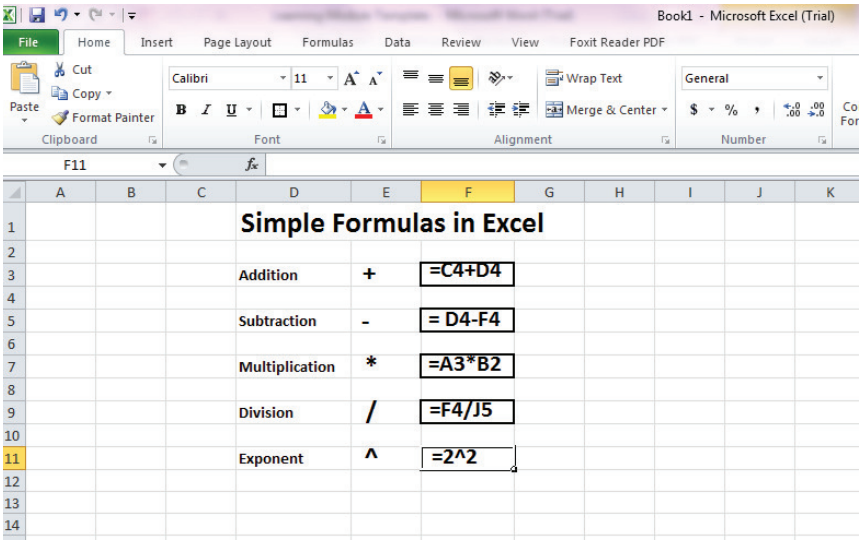
	Margin '11	Margin '10
Product 1	7,6%	6,7%
Product 2	3,4%	3,3%
Product 3	11,7%	10,9%
Product 4	8,9%	8,8%
Product 5	5,4%	6,9%
Product 6	12,6%	17,8%
Product 7	11,0%	10,1%
Product 8	10,2%	6,8%
Product 9	1,1%	-3,6%
Product 10	4,8%	-11,7%

3.1.2. Applying formulas to create functional worksheet.

- **Creating Formulas**
  There are different methods used for creating or inserting formulas in Excel. It can insert through predefined formulas, using cell references or it can create through using point and click method.

  Excel uses different standard operators for equations, such as

  i. A **plus sign** for addition (+)
  ii. **Minus sign** for subtraction (-)
  iii. **Asterisk** for multiplication (*)
  iv. **Forward** slash for division (/)
  v. **Caret for** exponents (^)



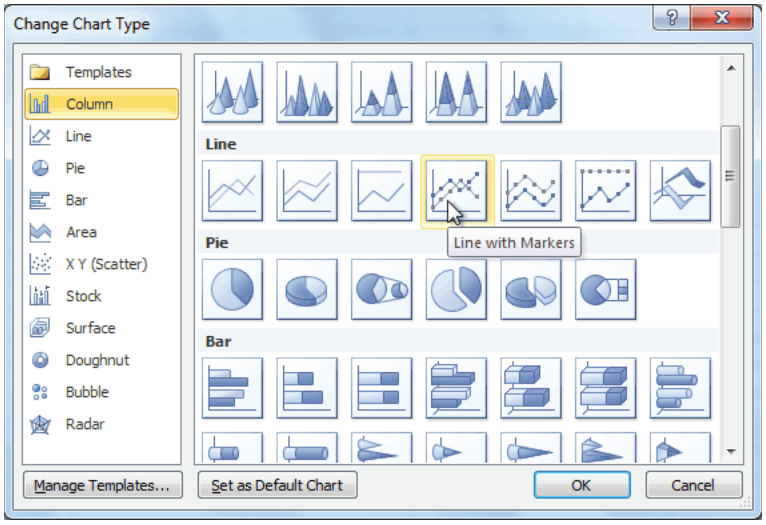
3.2. Create Charts / Graphs

3.2.1. Defining charts/Graphs.

A chart is a tool that is used in Excel to present **data graphically**. A chart, also called a graph, is a graphical representation of data, in which the data is represented by symbols, such as bars in a bar chart, lines in a line chart, or slices in a pie chart. A chart can represent numeric data, functions or some kinds of qualitative structure and provides different information. There are many types of chart / graphs used in Excel.

Chart is a visual representation of data. By using elements such as columns, or lines, a chart displays series of numeric data in a graphical format.

- **Excel Chat Type**
  MS Excel has different types of charts as shown in the picture below.



3.2.2. Creating a Chart in Excel

Select the **cells** that are wanted to chart, including the **column titles** and **row labels**. These cells will be the **source data** for the chart.

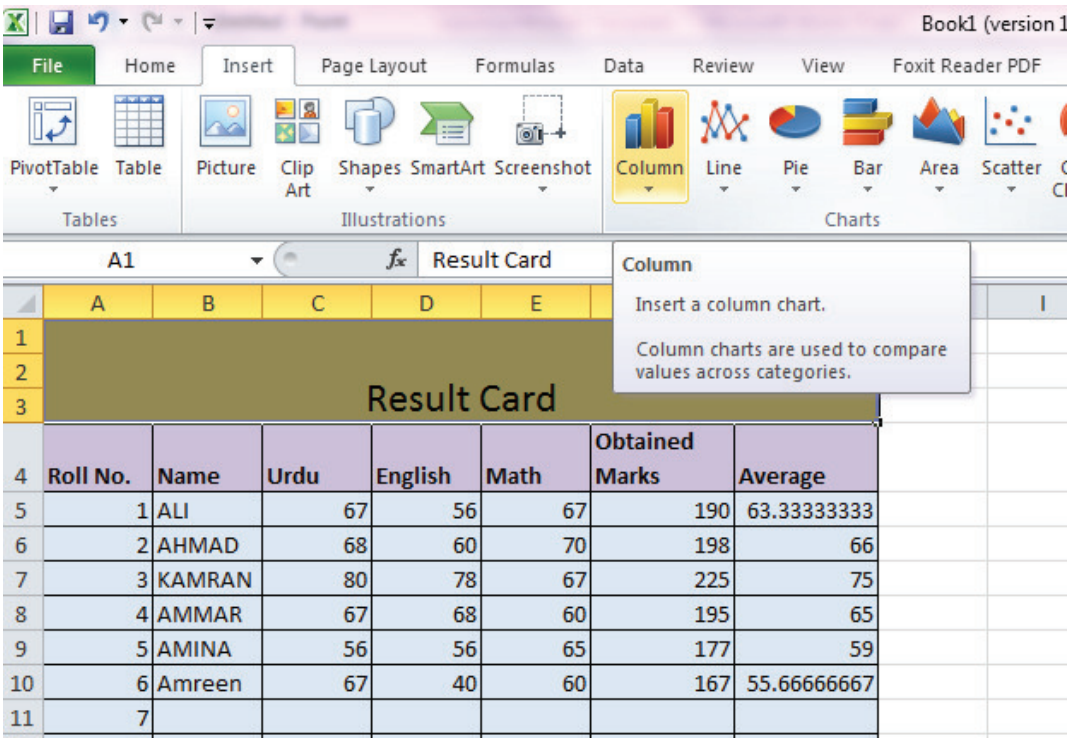
Do You Know

Charts are (called graphs in math class) visual representations of worksheet data.

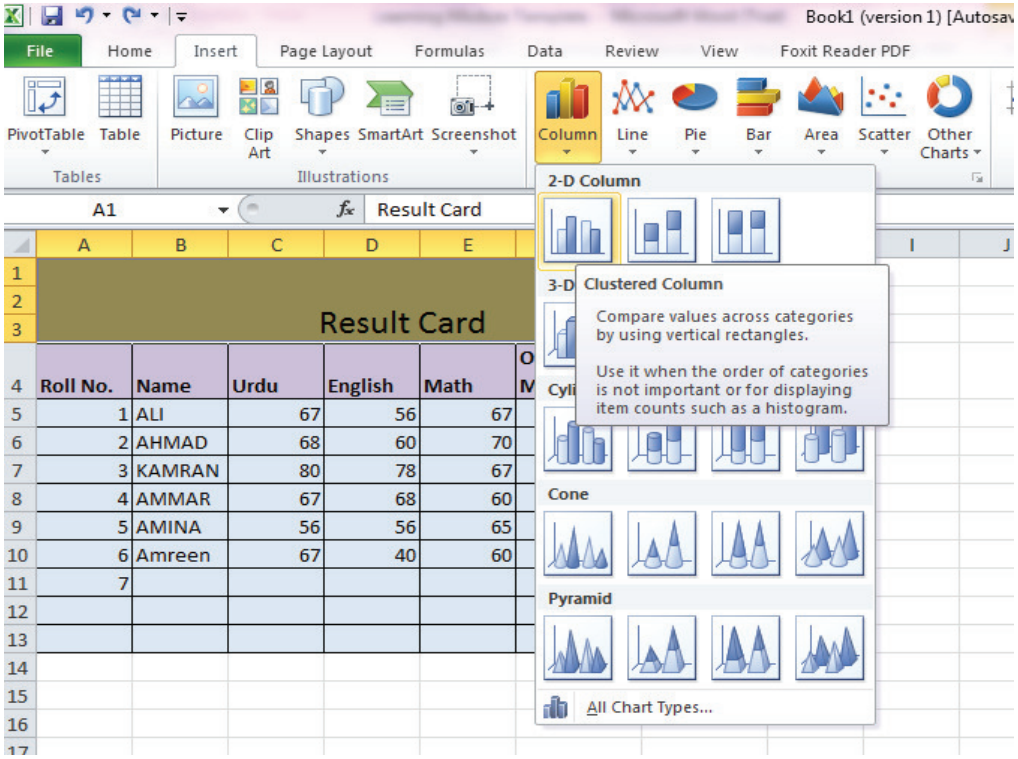
A1 | Result Card

	A	B	C	D	E	F	G
1							
2							
3				Result Card			
4	Roll No.	Name	Urdu	English	Math	Obtained Marks	Average
5	1	ALI	67	56	67	190	63.33333333
6	2	AHMAD	68	60	70	198	66
7	3	KAMRAN	80	78	67	225	75
8	4	AMMAR	67	68	60	195	65
9	5	AMINA	56	56	65	177	59
10	6	Amreen	67	40	60	167	55.66666667
11	7						
12							
13							
14							

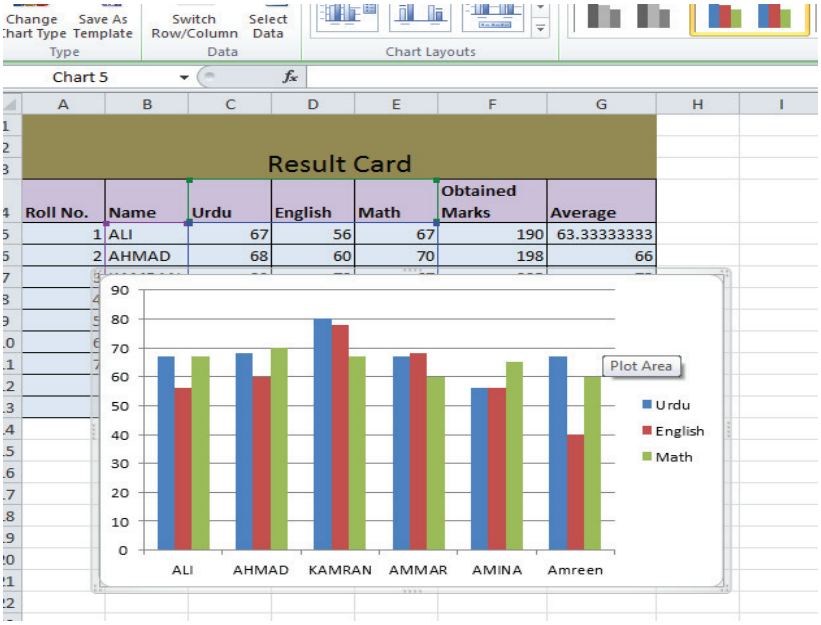
1) Click the **Insert** tab
2) In the **Charts** group, select the desired **chart.**



3) Select the desired **chart type** from the drop-down menu (**Clustered Column**, for example)



4) The chart will appear in the worksheet.

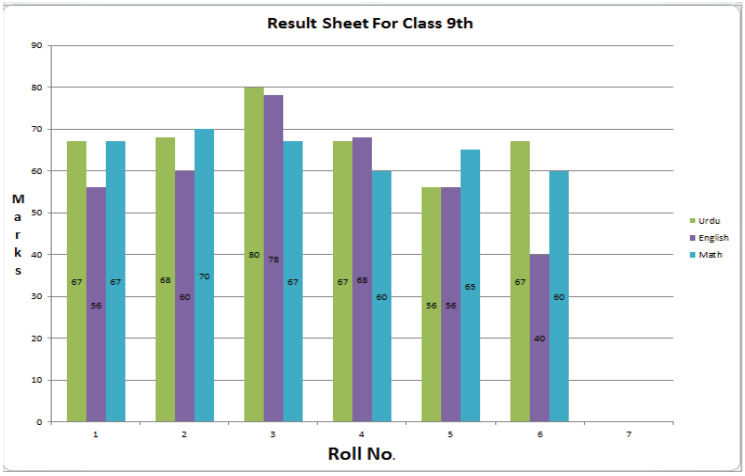


3.2.3. Using different charts in Excel.

The steps for creating a basic **column chart** in Excel are:

- Select the data which wanted to be in the chart. Insert row and column headings but not the title for the data table.
- Click on the Insert tab of the Ribbon.
- In the Charts box of the ribbon, click on the Insert Column Chart icon to open the drop-down list of available chart types.
- Hover mouse pointer over a chart type to read a description of the chart.
- Click on the desired chart.

A plain, unformatted chart that displays only the columns, representing the selected series, a default chart title, a legend, and axes values, will be added to the current worksheet.



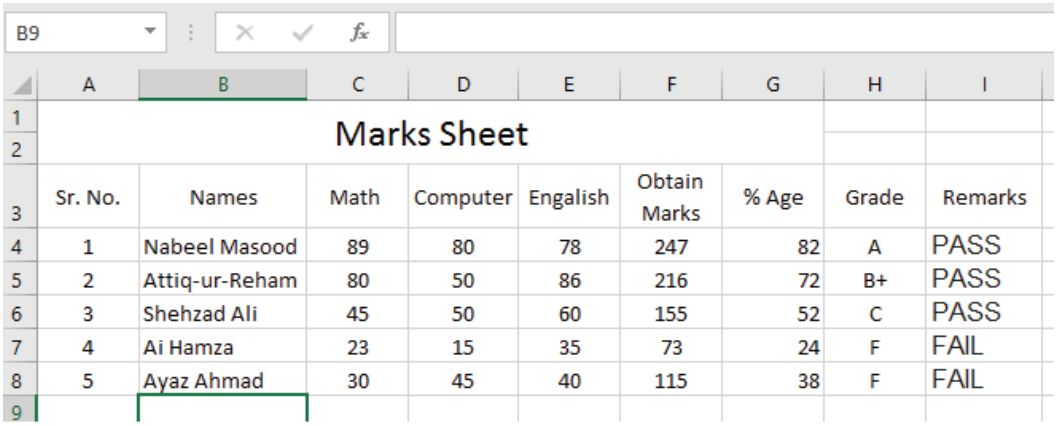
Practice-1

Create marks sheet in excel worksheet with the following criteria

- Minimum 5 subjects to enter
- Each subject carry 100 marks
- Find
  - vi. **Obtain marks**
  - i. **Percentage**
  - ii. **Average**
  - iii. **Auto Grade calculation with the following conditions**
    - If marks >= 90% then grade = “A+”
    - If marks>= 80% then grade= “A”
    - If marks>= 70% then grade= “B+”
    - If marks>= 60% then grade= “B”
    - If marks>= 50% then grade= “C”
    - If marks< 50% then grade= “F”
    - Auto Status calculation with the following conditions

- Status “Fail” if grade= ”F”
- Also “Fail” if subject marks below then 40%
- Else “Pass”

Solution



	A	B	C	D	E	F	G	H	I
1									
2				Marks Sheet					
3	Sr. No.	Names	Math	Computer	Engalish	Obtain Marks	% Age	Grade	Remarks
4	1	Nabeel Masood	89	80	78	247	82	A	PASS
5	2	Attiq-ur-Reham	80	50	86	216	72	B+	PASS
6	3	Shehzad Ali	45	50	60	155	52	C	PASS
7	4	Ai Hamza	23	15	35	73	24	F	FAIL
8	5	Ayaz Ahmad	30	45	40	115	38	F	FAIL
9									

Obtain Marks formula = Sum (C1:E1)

% Age Formula = G1/300*100

Grade Formula = **=**IF(H1>=90,"A+”, IF(H1>=80,"A”, IF(H1>=70,"B+”, IF(H1>=60,"B”, IF(H1>50,"C", IF(H1>=60,"F")))))

Remarks (pass or fail)

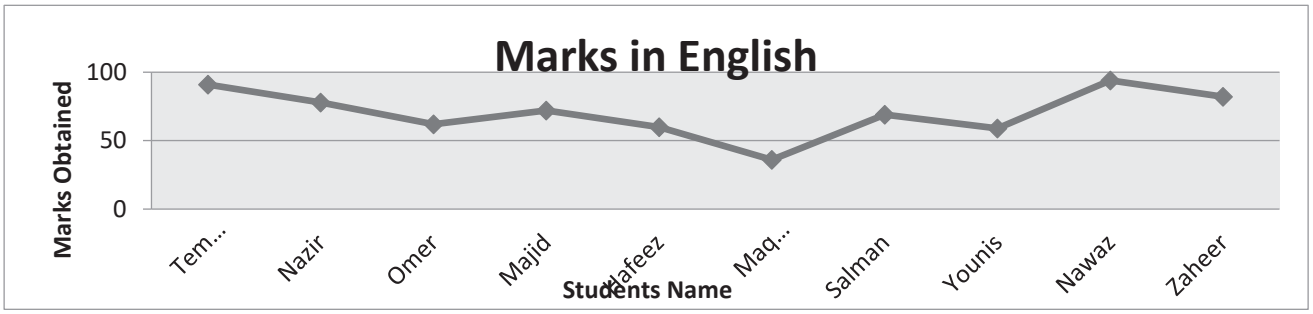
=IF(G1>50,” PASS”,” FAIL”)

INSTRUCTIONS

1. Create the worksheet given below
2. Calculate marks obtained
3. Calculate %age of each student while total marks = 550
4. Calculate Pass\Fail of each student by using If statement (Fromula)
5. Calculate Division of each students by using formula of If while:
Division 1st > = 60 2nd > = 50 3rd > = 33 & Fail < 33
6. Calculate grade of each students by using formula of If while:
Grade A+ > = 80 A > = 70 B > = 60 C > = 50 D > = 40 E > = 33 & Fail < 33
7. Insert your remarks on grades of each student that as follows
Grade A + = Mind Blowing A = Execllent B = Fantastic C = Very Good D = Good E = Satisfactory & Fail < 33
8. Draw a line graph of column student vs. English.

RESULT SHEET OF CENTRAL MODEL COLLEGE BAHAWAL NAGAR

R.No.	Student Name	Mathatic		Statics		English	Pak Studies	Marks Obtained	%-age	Pass or Fail	Division	Grade	Remarks
		A	B	A	B								
		100	100	100	100	100	50	550	100				
1	Temoor	85	88	85	90	91	46	485	88	Pass	1st	A+	Mind Blowing
2	Nazir	66	70	72	75	78	42	403	73	Pass	1st	A	Execllent
3	Omer	45	46	44	48	62	26	271	49	Pass	3rd	D	Good
4	Majid	75	78	73	74	72	36	408	74	Pass	1st	A	Execllent
5	Hafeez	62	56	60	58	60	32	328	60	Pass	2nd	C	Very Good
6	Maqbool	35	36	25	28	36	28	188	34	Pass	3rd	E	Satisfactory
7	Salman	70	68	67	68	69	36	378	69	Pass	1st	B	Fantastic
8	Younis	55	54	52	48	59	37	305	55	Pass	2nd	C	Very Good
9	Nawaz	90	95	96	95	94	50	520	95	Pass	1st	A+	Mind Blowing
10	Zaheer	78	86	85	78	82	46	455	83	Pass	1st	A+	Mind Blowing



(Marks Obtained) =SUM(C19:H19)

(% age) =I19*100/550

(Pass or Fail) =IF(J19>=33,"Pass","Fail")

(Division) =IF(J19>=60,"1st",IF(J19>=50,"2nd",IF(J19>=33,"3rd","Fail")))

(Grade)

=IF(J19>=80,"A+",IF(J19>=70,"A",IF(J19>=60,"B",IF(J19>=50,"C",IF(J19>=40,"D",IF(J19>=33,"E","Fail"))))))

(Remarks) =IF(M19="A+","Mind Blowing",IF(M19="A","Execllent",IF(M19="B","Fantastic",
IF(M19="C","Very Good",IF(M19="D","Good",IF(M19="E","Satisfactory","Fail"))))))

Practical Exercise-5

Topic: Prepare the following sheet: **Date: 08/03/2010**

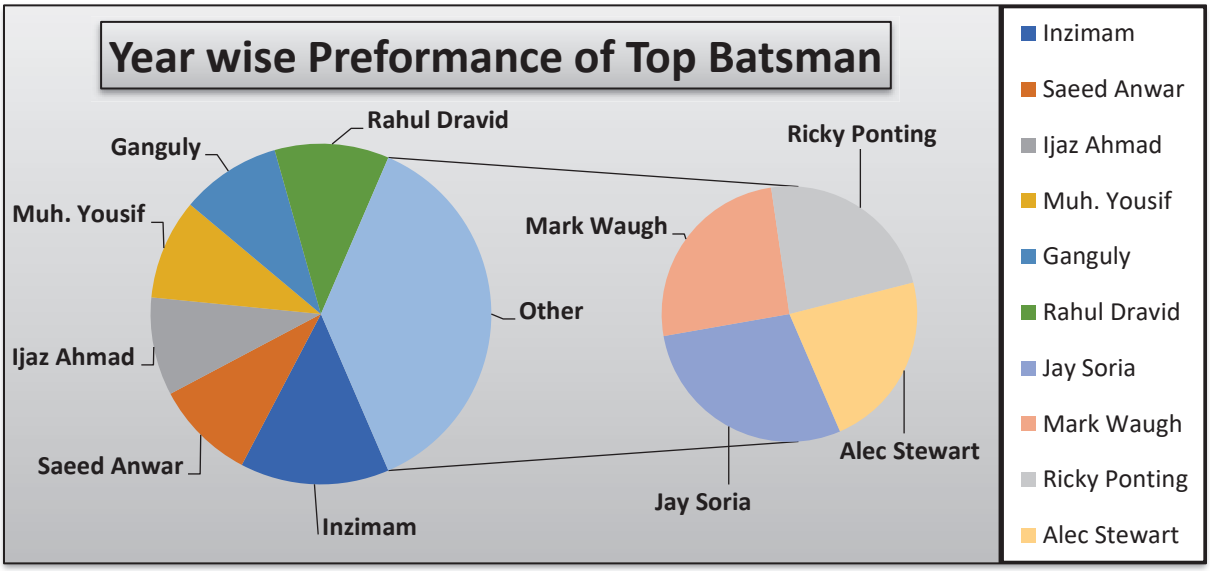
INSTRUCTIONS

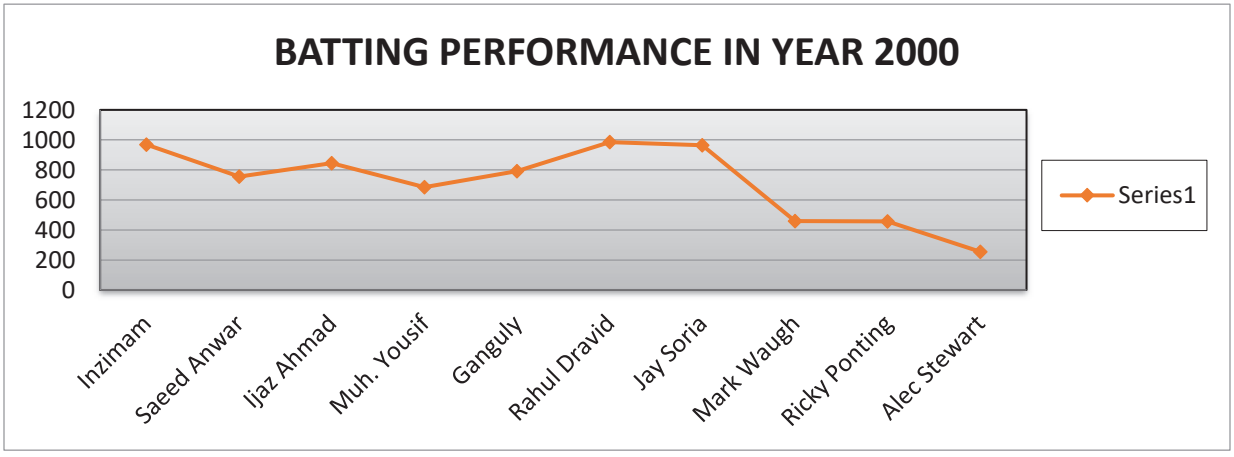
1- Calculate the worksheet given below.
2. Calculate Maximum Score as Row Wise.
3. Calculate Minimum Score as Column Wise.
4. Calculate Minimum Score as Row Wise.
5. Calculate Maximum Score as Column Wise.
6. Calculate Minimum Score as Overall the Table.
7. Calculate Maximum Score as Overall the Table.
8. Draw a Pie and line Graph from column Batsman Name to Year 2000.

INTERNATIOLNAL CRICKET PERFORMANCE

St. #	Batsman Name	Year 1995	Year 1996	Year 1997	Year 1998	Year 1999	Year 2000	Minimum Score	Maximum Score
1	Inzimam	456	986	875	795	1285	968	456	1285
2	Saeed Anwar	789	867	856	756	784	755	755	867
3	Ijaz Ahmad	568	598	489	845	457	845	457	845
4	Muh. Yousif	865	485	785	745	654	684	485	865
5	Ganguly	789	864	785	458	698	792	458	864
6	Rahul Dravid	598	854	489	456	675	985	456	985
7	Jay Soria	756	565	785	746	458	965	458	965
8	Mark Waugh	795	856	765	699	587	459	459	856
9	Ricky Ponting	784	489	764	678	685	456	456	784
10	Alec Stewart	756	597	486	684	675	255	255	756
Minimum Score		456	485	486	456	457	255	BEST	SCORE
Maximum Score		865	986	875	845	1285	985		
		Overall Minimum Score				255			
		Overall Maximum Score				1285			

(Maximum Score as Row Wise)	=MAX (C15:H15)
(Maximum Score as Column Wise)	=MAX (C15:C24)
(Minimum Score as Row Wise)	=MIN (C15:H15)
(Minimum Score as Colum Wise)	=MIN (C15:C24)
(Overall Minimum Score)	=MIN (I15:I24, C25:H25)
(Overall Maximum Score)	=MAX (J15:J24, C26:H26)





Learning Unit 4:
Prepare a presentation using MS PowerPoint

Objective:

PowerPoint is a Microsoft's presentation software that enables users to create engaging presentations consisting of individual pages, or slides, which may contain text, graphics, sound, movies, hyperlinks, and other objects. PowerPoint enables users to add animation and effects to slideshow elements. Presentations can be printed, displayed, notated, and navigated by the presenter.

After completion of this Learning Unit you will be able to:

- Insert slides with different layouts according to the requirements of presentation
- Insert text, tables, images, etc. according to the requirements.
- Apply a set of effects to animate the slide according to the requirements.
- Apply slide transitions on slides according to the requirement.
- Apply sound effects on objects/text/images according to job requirements.

4. Power Point 2010

Getting started with PowerPoint 2010 you will notice that there are many similar features to previous versions. You will also notice that there are many new features that you'll be able to utilize. There are three features that you should remember as you work within PowerPoint 2010: the Microsoft Office Button, the Quick Access Toolbar, and the Ribbon.

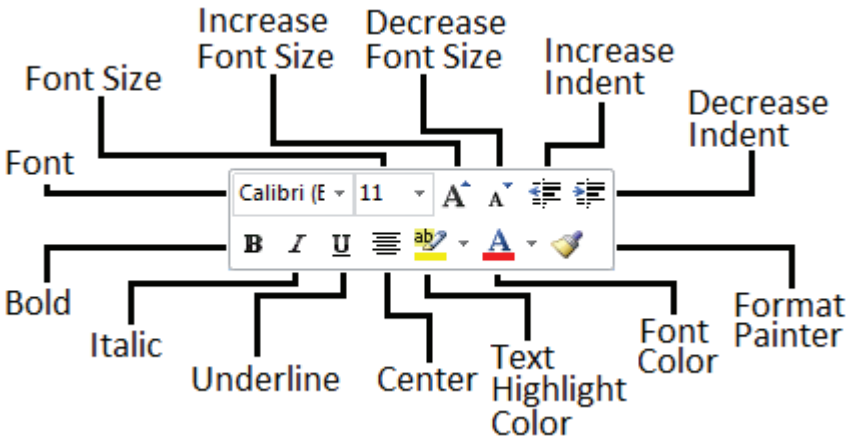
4.1. Layout and interface of PowerPoint

4.1.1. Presentations

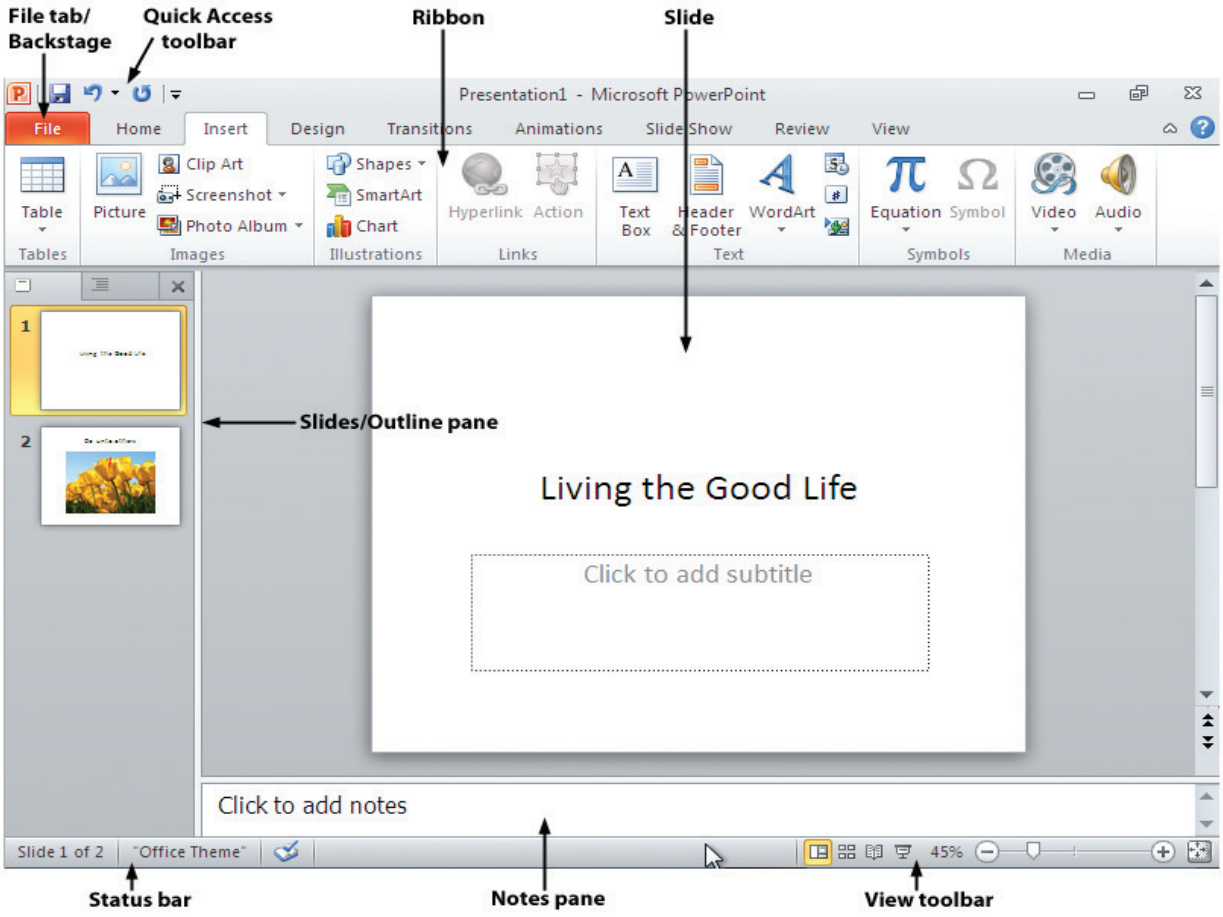
A presentation is a collection of data and information that is to be delivered to a specific audience. A PowerPoint presentation is a collection of electronic slides that can have text, pictures, graphics, tables, sound and video. This collection can run automatically or can be controlled by a presenter.

4.1.2. Mini Toolbar

A new feature in Office 2010 is the Mini Toolbar. This is a floating toolbar that is displayed when you select text or right-click text. It displays common formatting tools, such as Bold, Italics, Fonts, Font Size and Font Color.



4.1.3. Layout of Power point



4.2. Define Slide and different layout of Power Point

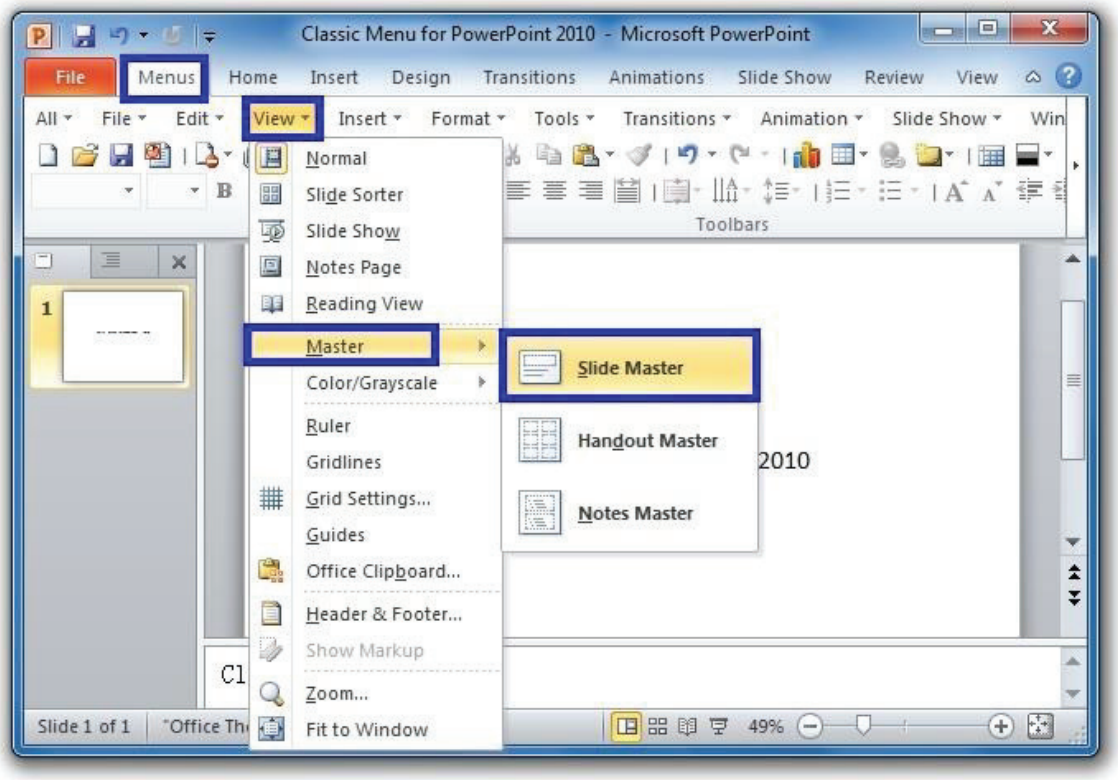
Slide Views Presentations can be viewed in a variety of manners. On the View tab, the Presentation Views group allows you to view the slides as Normal, Slide Sorter, Notes Page, Slide Show, Slide Master, Handout Master, and Notes Master.

Remember

Every presentation contains at least one slide master

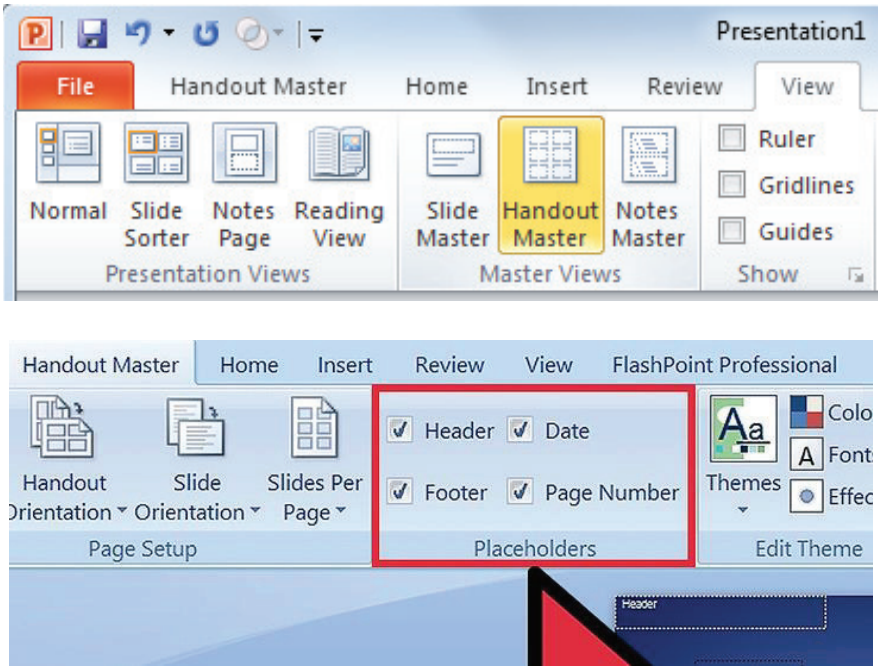
4.2.1. Slide Master

A slide master is the top slide that stores information about the theme and slide layouts of a presentation. It includes the **background, color, fonts, effects, and positioning**. By using Slide Master, affects can be added in every slide. Individual slide layouts can also be modified using this feature



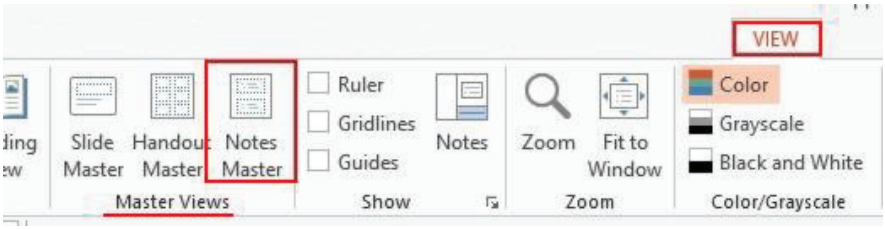
4.2.2. Handout Master

Handout master view in PowerPoint 2010. Handout master customize your presentation and will look as a printing handout. You can choose the design and layout of the handout, such as background formatting and where header/footer will appear. You can also select option your page setup.



4.2.3 Notes Master

A presentation may have a notes master part (zero or one). The notes master determines the background elements and default layout of a **notes** page



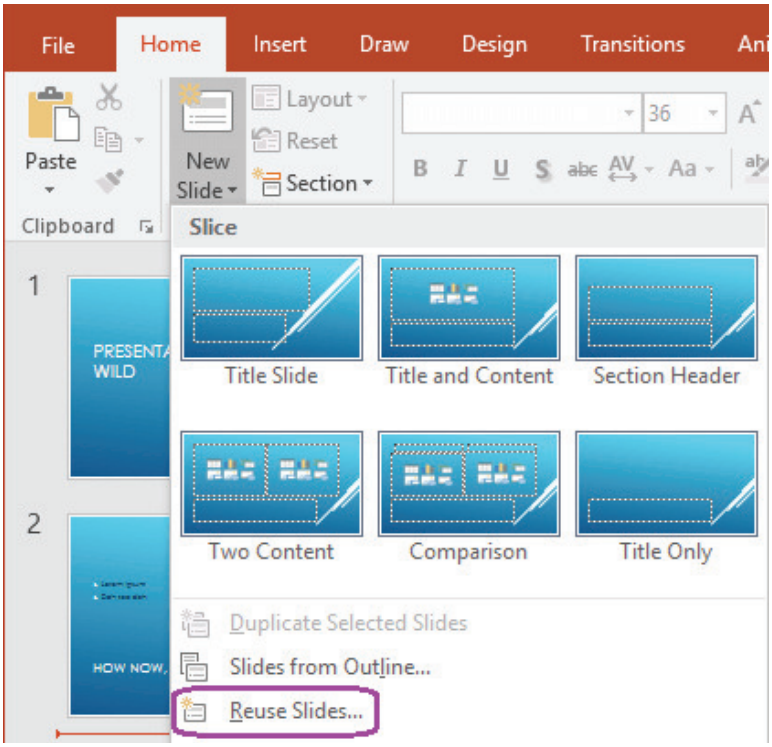
4.3. Insert Slides with different layout.

One or more slides can be added in a presentation easily.
Following are the steps.

Remember

Duplicate slide can be added by copy and paste the existing slide again.

i. Open MS Power point.
ii. Under the Home tab.
iii. Click on New Slides
iv. Select the desired layout of a slides.
v. The slide will be inserted.

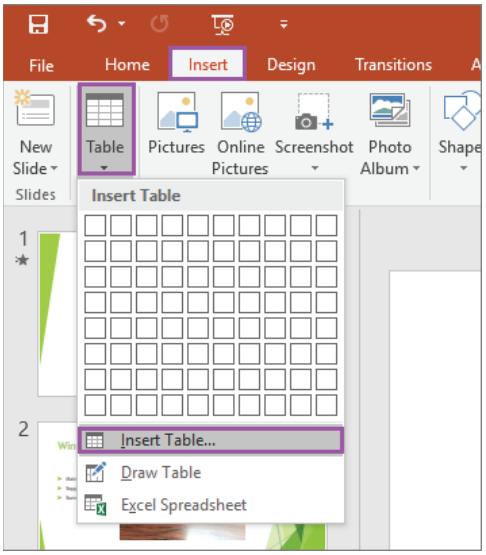


4.4. Insert Table picture, Picture, Text Box, Shape and Action Button.

4.4.1. Insert Table:

Add table in your slide
Following are the steps.

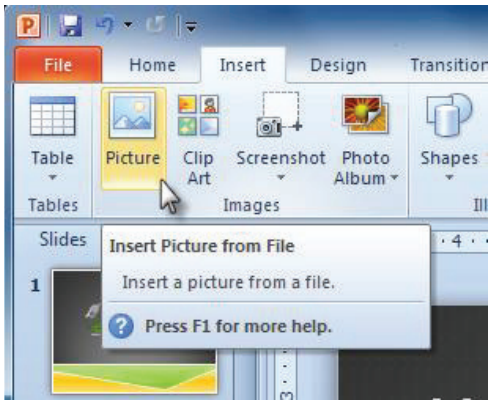
i. Open MS Power point.
ii. Under the Insert tab.
iii. Click on tables
iv. Select the desired rows and columns
v. The table will be inserted.



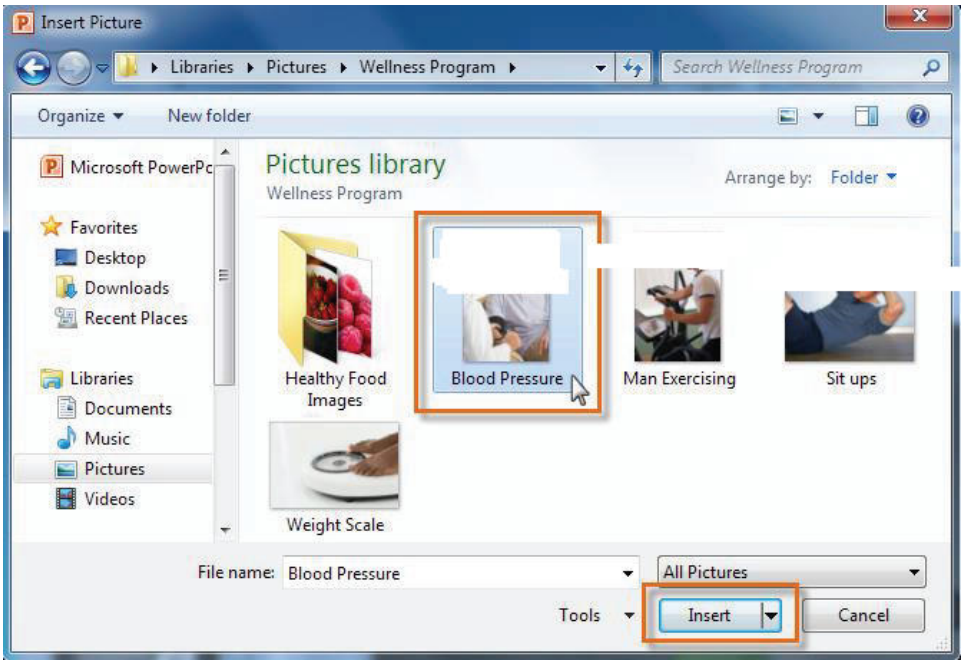
4.4.2. Insert Picture

Add picture in you slide
Following are the steps.

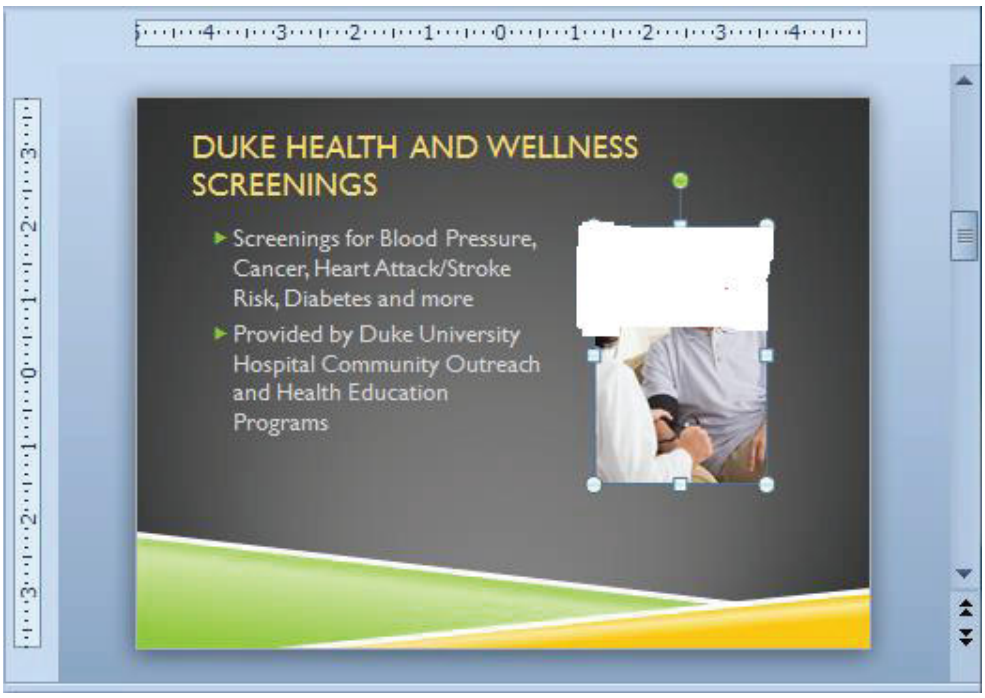
i. Open MS Power point.
ii. Under the Home tab.
iii. Click on picture



iv. Select the desired image file, then click inset.

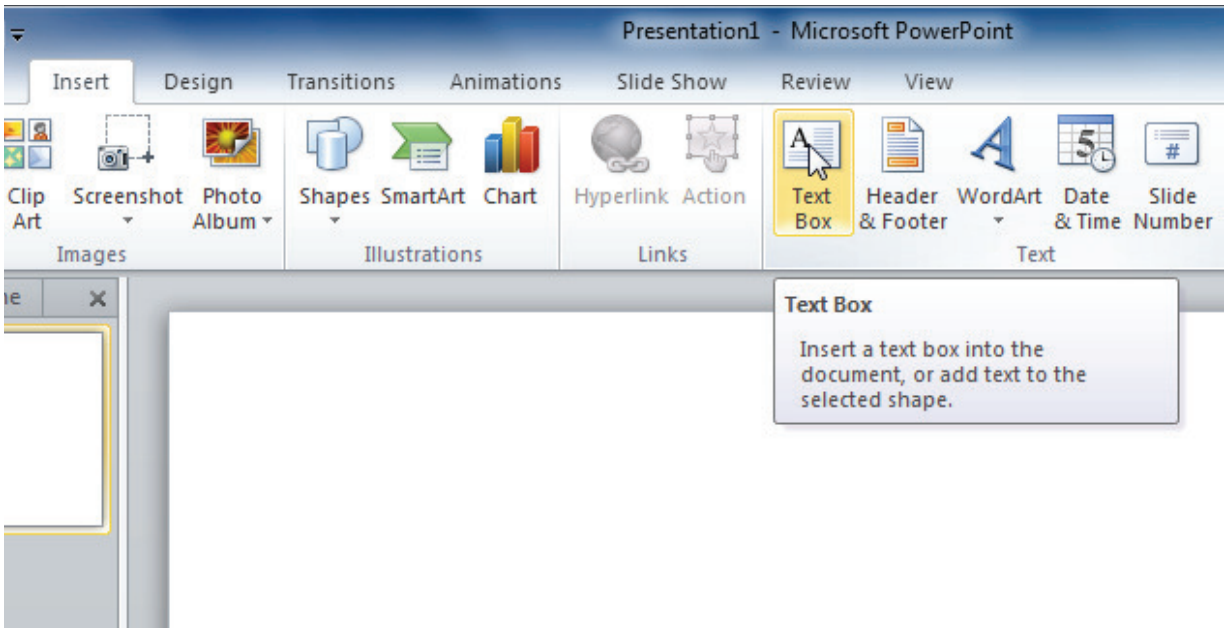


v. The picture will appear in your slide



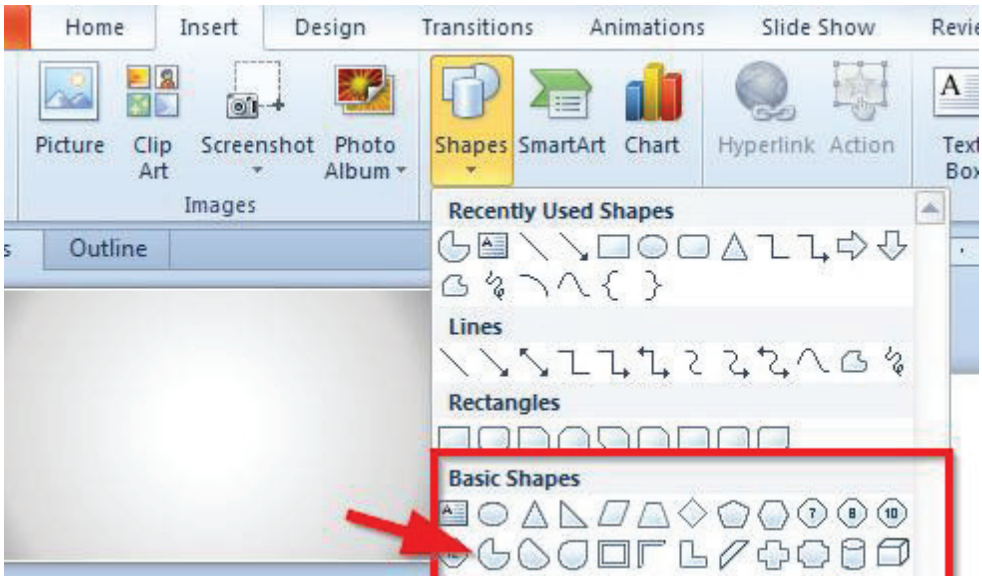
4.4.3. Insert Textbox

i. Open MS Power point.
ii. Under the Insert tab.
iii. Click on text box
iv. Select the desired rows and columns
v. The table will be inserted on insert tab
vi. Select



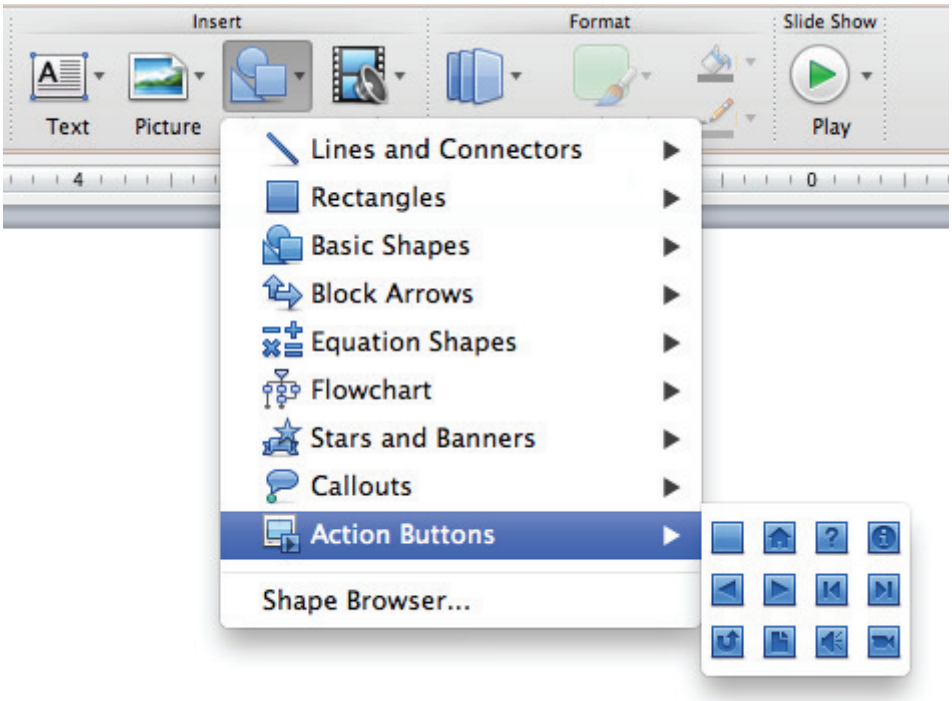
4.4.4. Inset Shape

i. Open MS Power point.
ii. Under the Insert tab.
iii. Click on shapes
iv. Select the desired shape and insert shape
v. The shape will be inserted



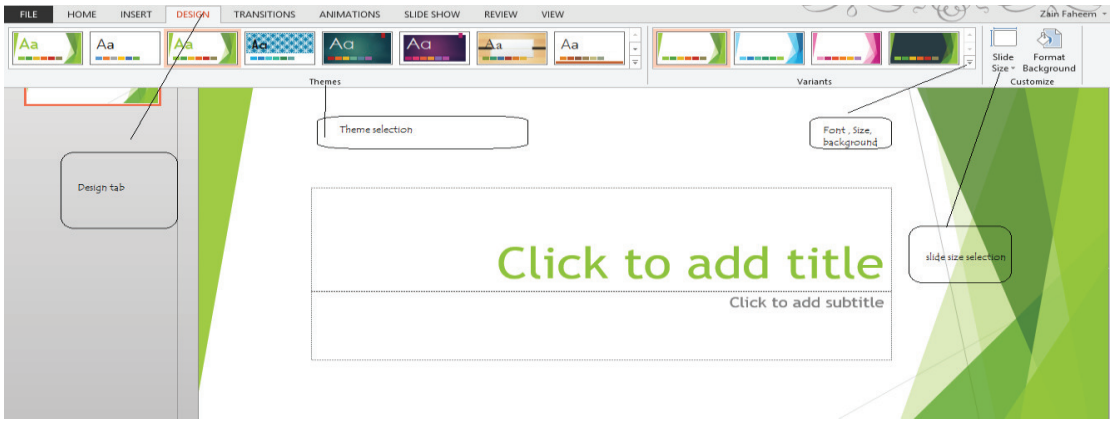
4.4.5. **Action** Button

Action buttons are built-in shapes you can add to a presentation and set to link to another slide, play a sound, or perform a similar **action**. When someone clicks or hovers over the **button**, the selected **action** will occur. **Action buttons** can do many of the same things as hyperlinks.



4.4.6. **Insert Design and Backgrounds**

i. Open MS Power point.
ii. Under the design tab.



iii. Click the theme and choose appropriate theme from the available list or add new theme from the saved file.

iv. For creation of new theme select customize background option and choose on choice background form the list.

v. Click the variant option.

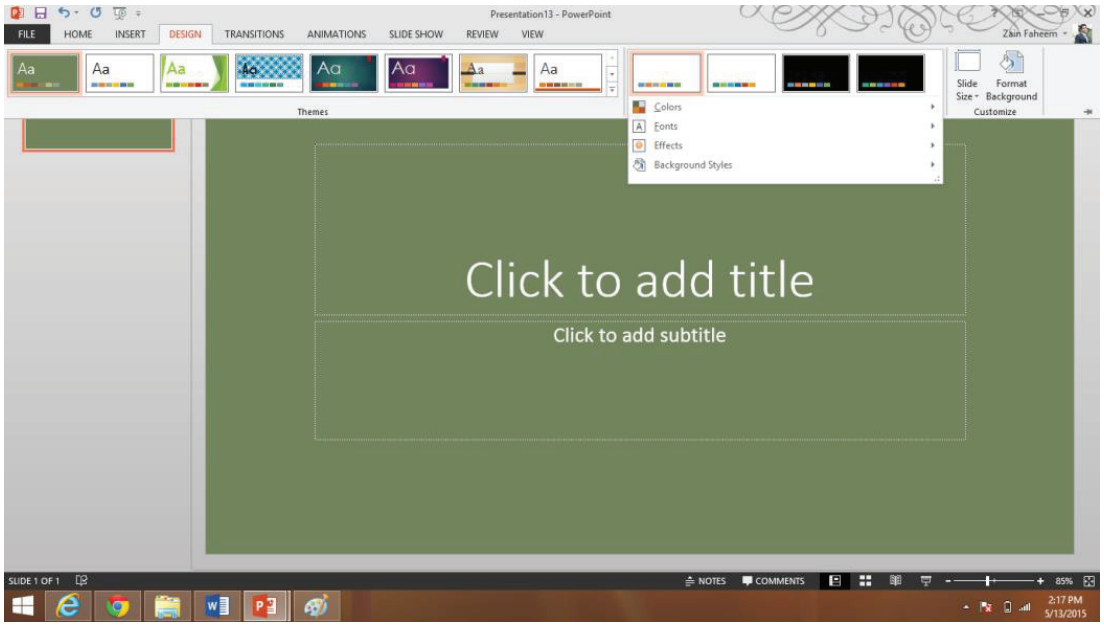
vi. Click Font and select appropriate font

vii. Click Color and select suitable color scheme

viii. Click Background styles and select desired background

ix. Click Effect and select appropriate effect

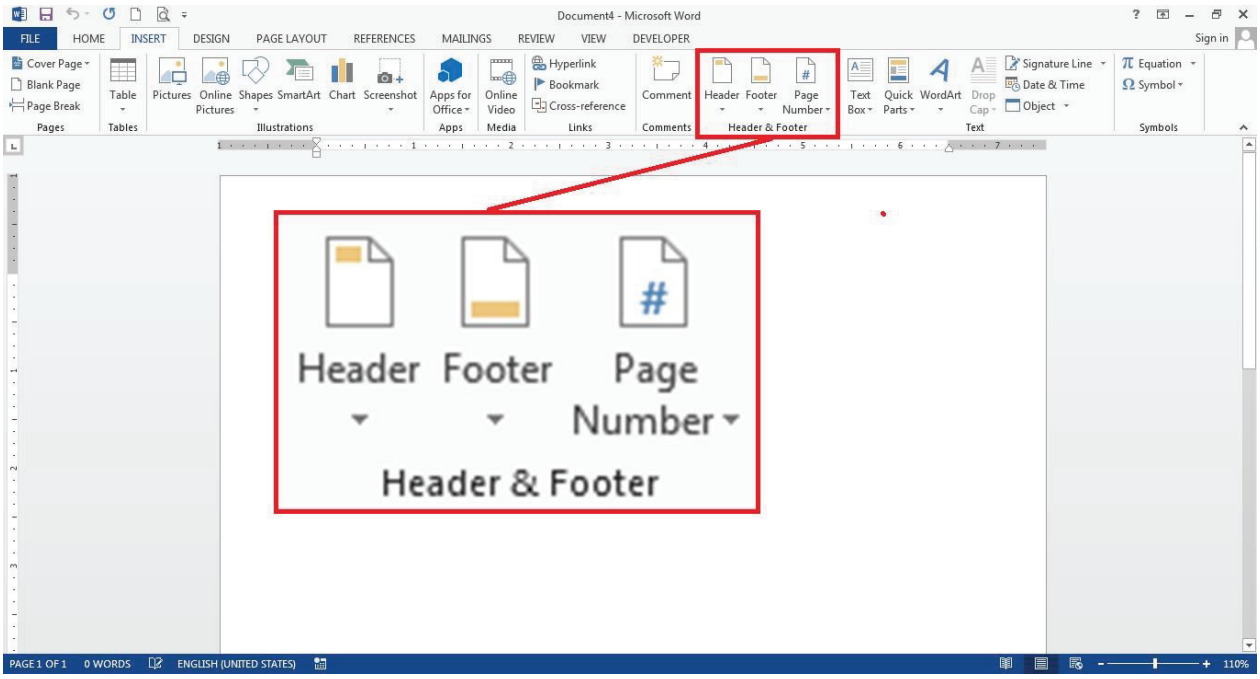
x. Click size of the Slide, it shows two **options, choose one option**

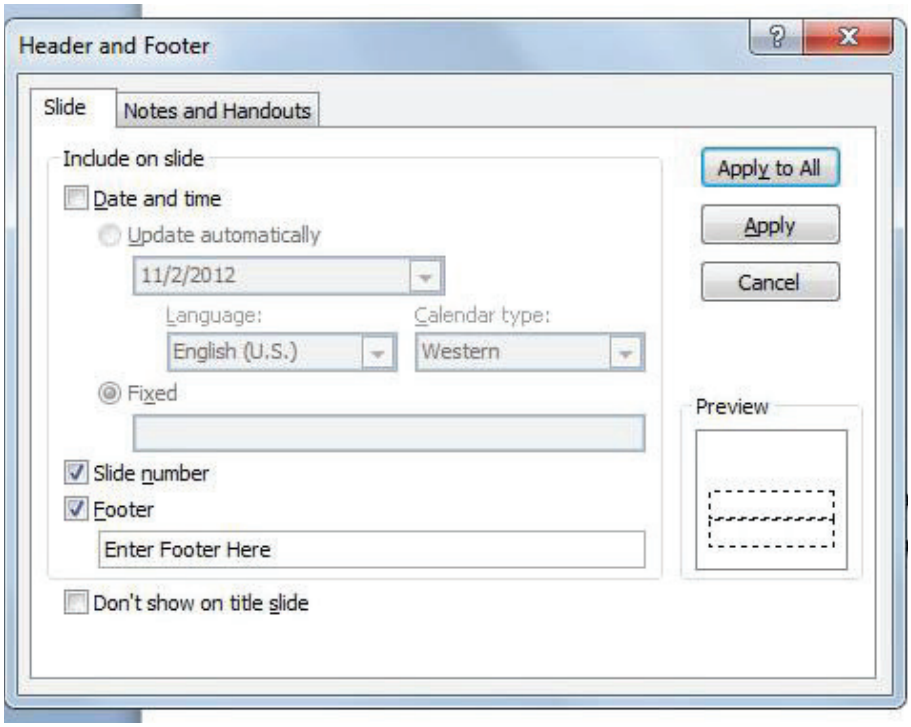


xi. Newly created slide deign is shown in the task pane

4.5. Insert header/footer, date and numbering to slides

i. Open MS Power point.
ii. Under the Insert tab.
iii. Go text group
iv. Click on header and footer
v. Select header and footer
vi. In header and footer also mention time and date





4.6. Apply a set of effects to animate the slide

4.6.1. Animation

Animations are visual effects applied to individual items on the slide such as graphics, titles or bullet points. Animation can help to make a PowerPoint presentation more dynamic, visually interesting, automation and to grab the audience's attention. The most common types of animation effects include entrances, exits, emphasis and motion paths.

Definition

Animation can be useful in making a presentation more dynamic, and help to emphasize points,

Types of Animations

- **Entrance effects:** Make an object fade gradually into focus, fly onto the slide from an edge, or bounce into view.
- **Exit effects:** Making an object fly off from the slide, disappear from view, or spiral off of the slide.
- **Emphasis effects**: Making an object shrink or grow in size, change colour, or spin on its centre.
- **Motion Paths:** Make an object move up or down, left or right, or in a star or circular pattern (among other effects).

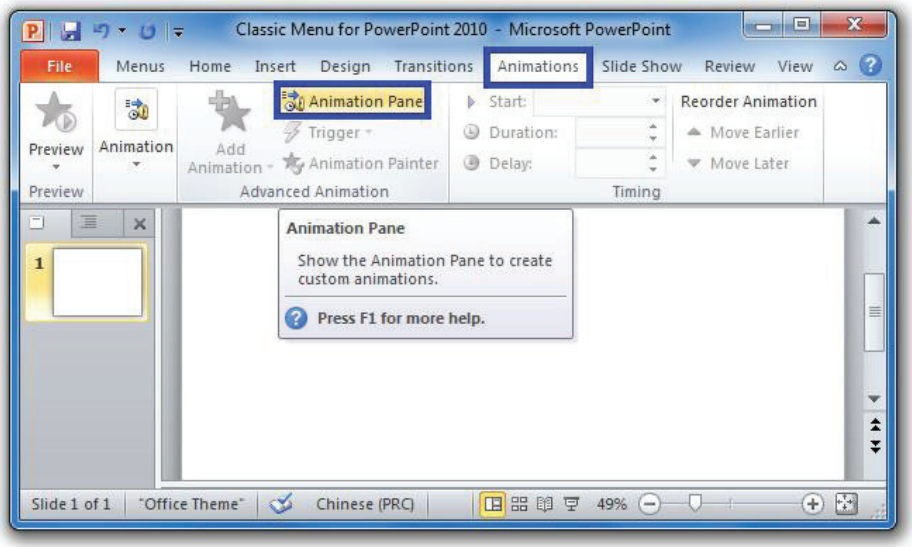
Remember

Too much animation can be distracting.

Applying an Animation to slides

i. Select the text or object to apply animation
ii. Click the animations tab from main menu
iii. Click an animation effect from the animation group gallery.
iv. Click the more arrow to see more options
v. Animation applied to the object.
vi. Click Effect options and select the effect to, how animation have effects.

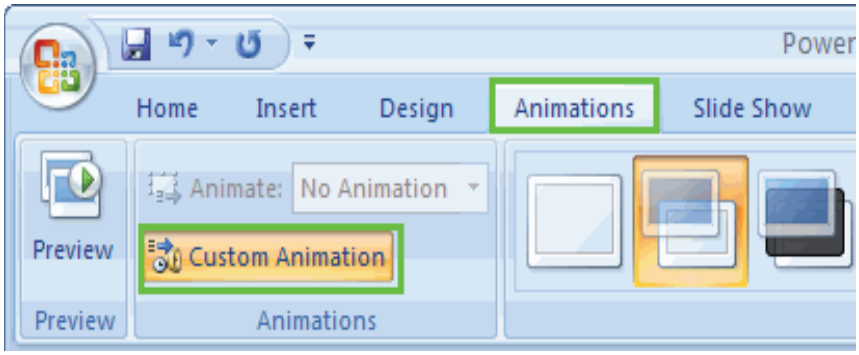
To specify the timing of the effects, on the **Animations** tab, use the commands in the **Timing** group



Perform custom Animation on one slide

Custom animation allows you to consider the objects or the text boxes in a slide, one at a time, and to animate them as desired by the person not as given in the software.

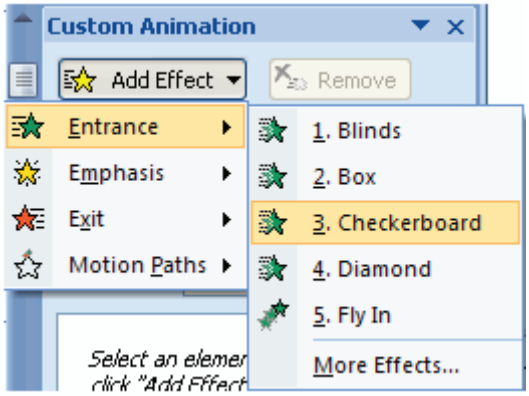
i. Select the slide to which the animation is to be applied.
ii. Select the animations tab and the animation group.



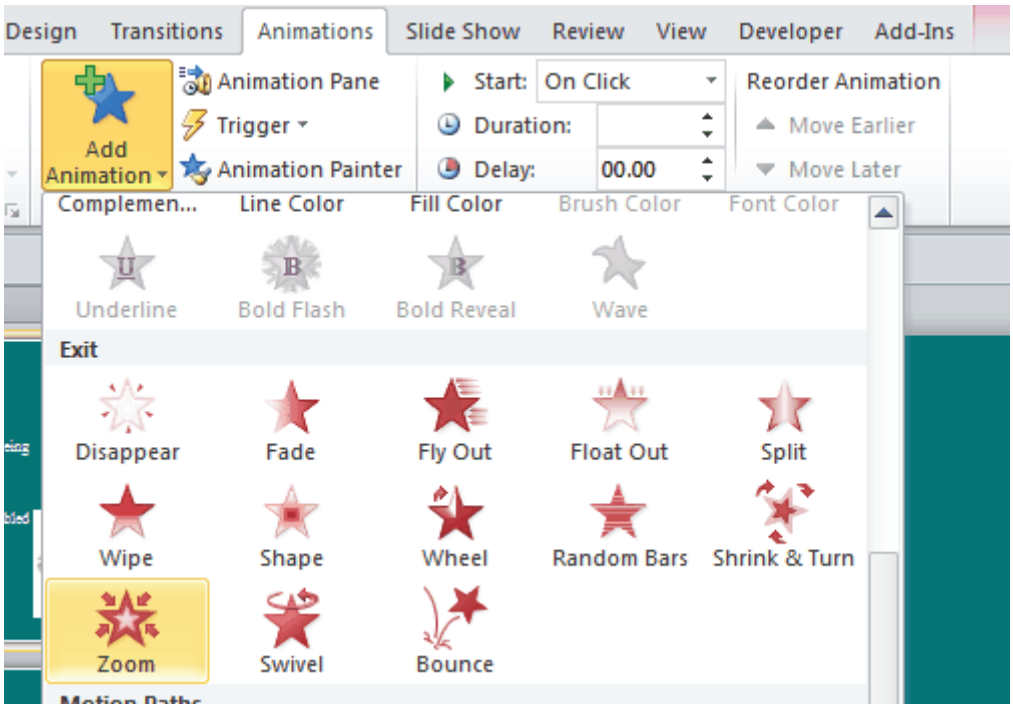
iii. Click on custom animation.
iv. Click add Effect.

A menu appears with a list of effect categories.

i. Entrance effects control how the element enters the slide.
ii. Emphasis effects make the element do something after it enters the slide.
iii. Exit effects control how it leaves the slide.
iv. Motion paths allow you to specify where the element travels on the slide.



v. Select one of the effects. Details about the effect appear in the Animation Pane.
vi. In the Start field, use the drop-down menu to select an event which will trigger the animation.
vii. In the Direction field, use the drop-down menu to select a direction for the animation. The significance of the direction depends on animation type.
viii. In the Speed field, use the drop-down menu to select a speed for the animation.



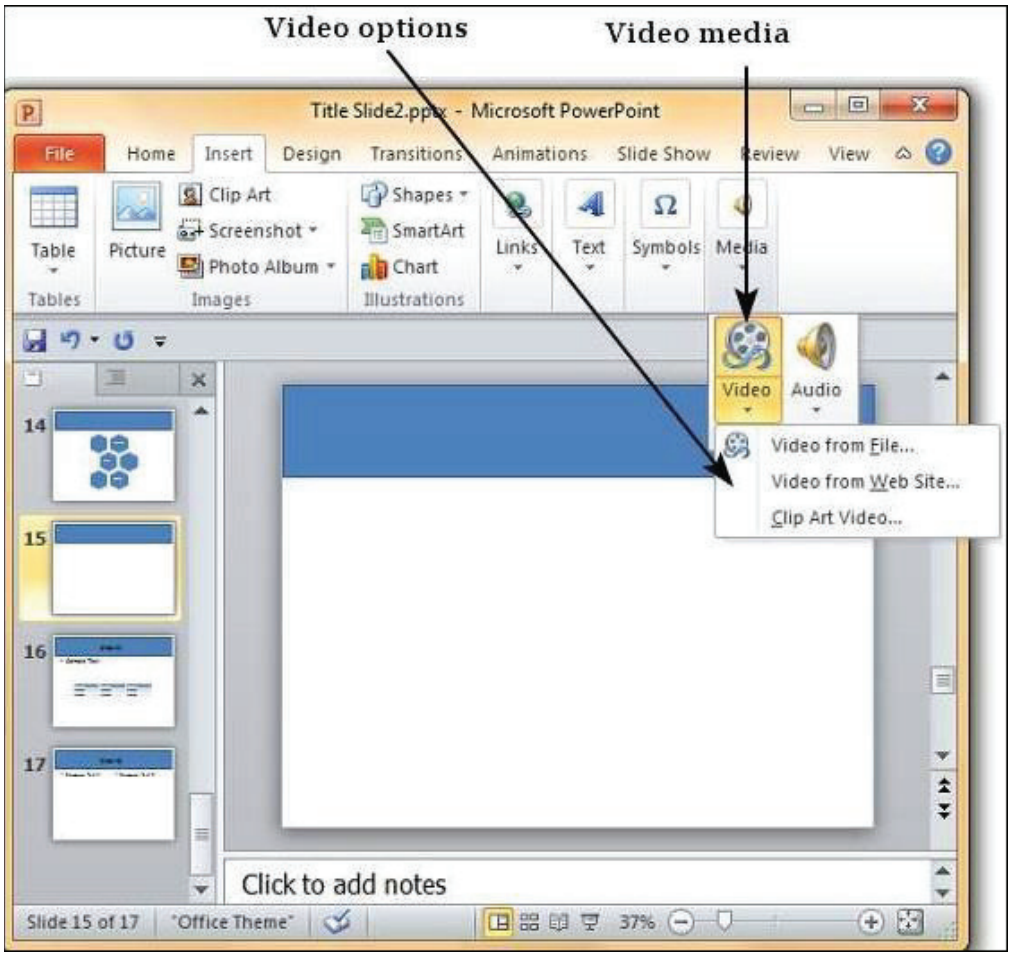
4.7. Apply Sound Effects

Power Point supports multimedia in the slides. You can add audio or video clips to the slides which can be played during the presentation.

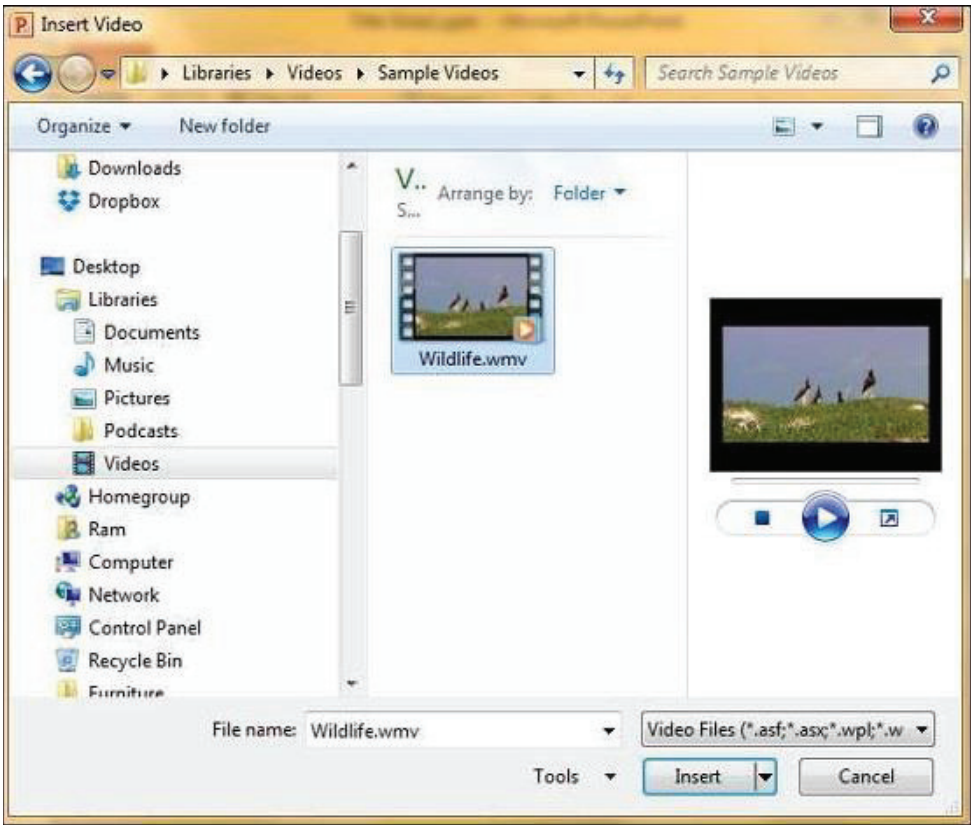
The following steps will help you add audio or video file to the slides.

- **Step - 1**
  Go to the **Media** group under the **Insert** ribbon

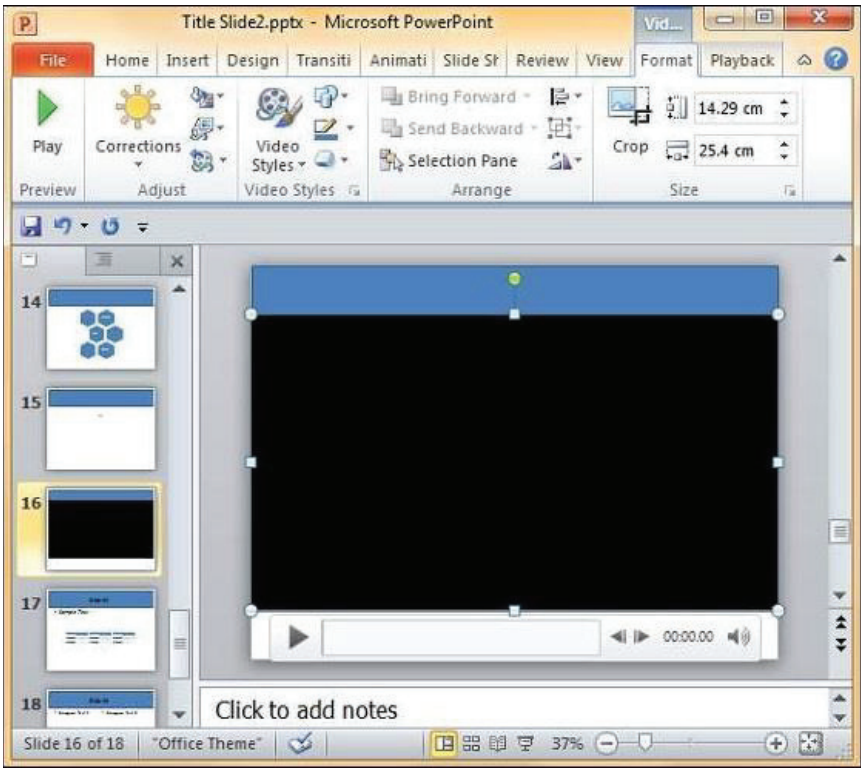
- **Step 2**
  To insert video file, select **Video** as media type and **Video from File** to insert a video from your computer or hard drive.



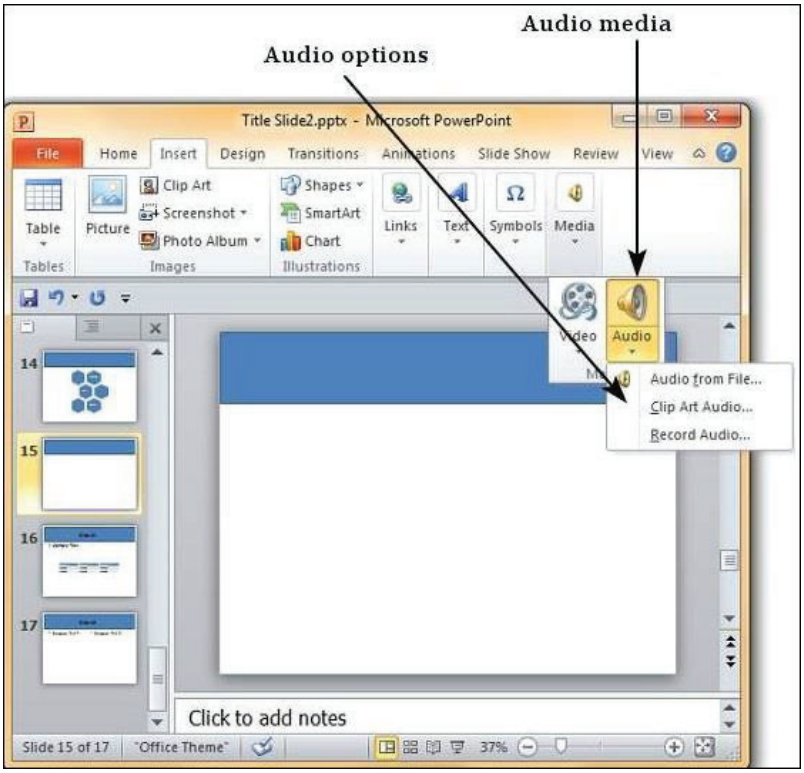
- **Step 3**
  In the **Insert Video** dialog, browse for a video file and click Insert.



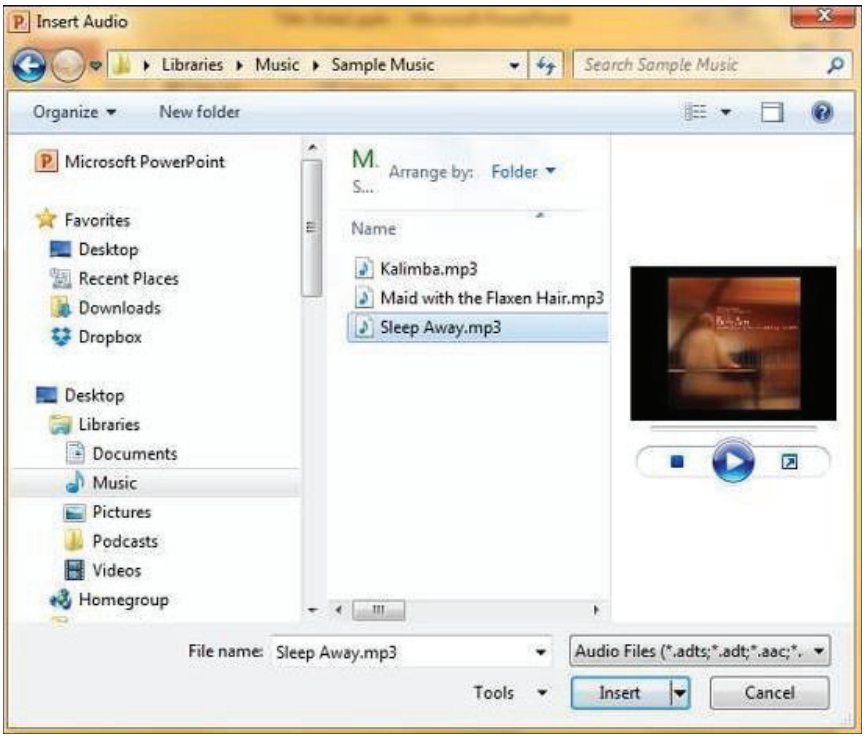
- **Step 4**
  You will now see that a Video file is added to the slide.



- **Step-5**
  To insert audio file, select **Audio** as media type and **Audio from File** to insert an Audio from your computer or hard drive.



- **Step-6**
  In the **Insert Audio** dialog, browse for an audio file and click **Insert**.

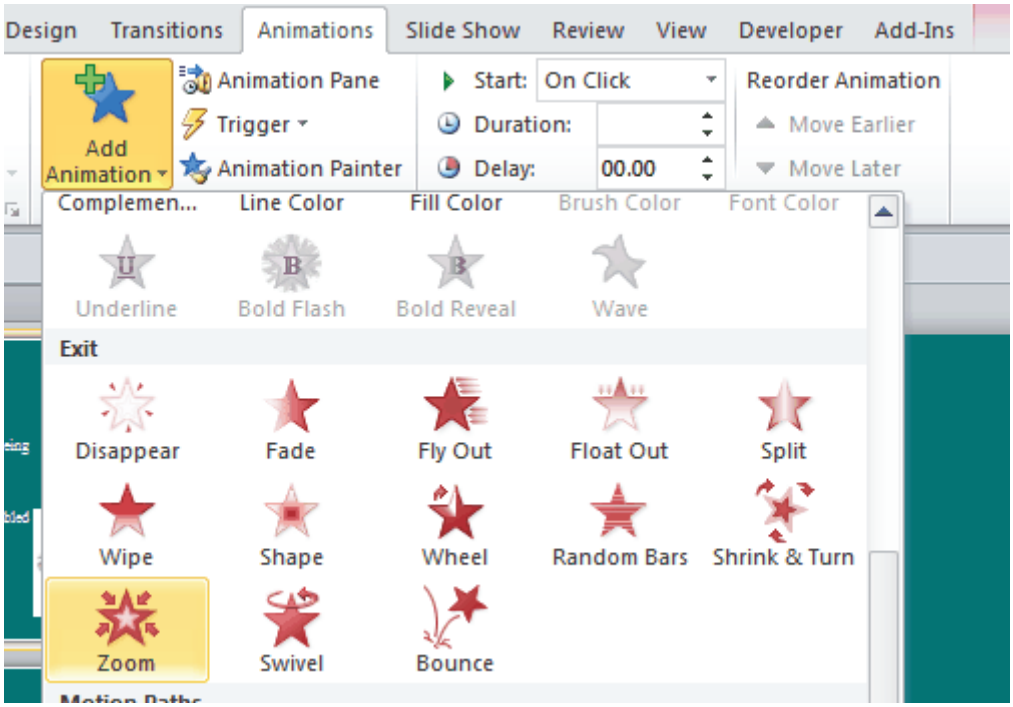


Practice-1

Create 10 slides presentation about your Institute with the following instructions

1) Create a slide design template
2) Apply any option from following Animations
    - Entrance effects
    - Emphasis effects
3) Apply Sound Effects to each slide
4) Set transaction timing up to 3 seconds
5) Set animation timing up to 5 seconds
6) Set animation on auto.
7) Each slide has different design
8) Apply motion path on object in at least one slide.

- **Solution:**
  See the above topic 1.7 (Animation) and follow instructions for said solutions.



Summary of Module

This module is designed to provide skills and knowledge related to basic computer hardware, software, applications and troubleshooting. You will be able to demonstrate your skills in operating a computer system and computer applications such as MS Word, MS PowerPoint, MS Excel as well as installation and troubleshooting of operating system and software.

Trainees will learn to configure Computer System. They get skill to connect computer components and peripherals as per requirements. Install system software and application software according to the Instructional Manual. Troubleshoot applications to trace and fix faults (if any) to bring it in a running condition. Follow health, safety and security procedures to ensure safe working environment.

Trainee will get skill to create a document using MS Word. They will compose a document as per the requirements. Assign name and location to save a file in word file format. Format word document according to given requirements. Generate hard copy according to job requirements.

Trainee will get skill to prepare worksheets and workbooks using MS Excel. They will develop a worksheet as per given data. Format the worksheet according to given job requirement. Apply formula according to given criteria. Generate Charts / Graphs according to the given data and security procedures to ensure safe working environment.

Trainee will get skill to prepare a presentation comprising of slides using MS PowerPoint. This will enable users to create engaging presentations consisting of individual pages, or slides in different layouts. They will insert text, tables, which may contain text, graphics, sound, movies, hyperlinks, and other objects. This software also enables user to add animation and effects to slideshow elements. Presentations can be printed, displayed, notated, and navigated by the presenter. They can apply slide transitions on slides according to the requirement. Apply sound effects on objects/text/images according to job requirements.

Question and Answers:

FAQ - 1 **What are the common types of Operating system??**

Answer : Most common types of operating system are Windows, Linux ,Unix, Mac OS, Solaris, etc.

FAQ - 2 **What are the Peripheral devices?**

Answer : A computer peripheral device is an external device that provides input and output for the computer like keyboard, mouse, LCD, monitor, Printer, scanner web cam etc.

FAQ - 3 **What is application software?**

Answer : Application software is the software is used at offices, home and school etc., like word processing, spreadsheets, Database, Graphics software, designed to perform specific tasks for users.

FAQ - 4 **What is a software update means?**

Answer : A software update means to enhance the capability, stability and features of an existing version of the software. Updates usually download free of cost while upgrading means replace an older version of the same product with the newer version.

FAQ - 5 **What is the right way to uninstall a program?**

Answer : The proper way to uninstall a program is to use the uninstall routine that is provided with the program itself, or from using control panel.

FAQ - 6 **What does scanning means??**

Answer : Scanning a computer means detect and remove viruses and malwares from the computer.

FAQ - 7 **What are computer viruses or bugs??**

Answer : Computer viruses are small software programs that are designed to spread from one computer to another and to interfere with computer functioning.

FAQ - 8 **What is external mass storage??**

Answer : External mass storage is the device that is attached to the computer with a network/ cable and can be removed without opening computer case, like hard disk, USB flash drive, CD, floppy disk etc.

FAQ - 9 **What is software troubleshooting process?**

Answer : The software troubleshooting process starts with identifying the problem, checking on possible issues that can cause such problems and then working on measures and alternatives to find a solution.

FAQ - 10 **What is internet and what are its basic parts for connectivity?**

Answer : Internet is used to send and receive email, browse the Web, watch movies, and more. Before accessing the Internet, there are things needed, an Internet service, internet connectivity device, and a web browser.

FAQ - 11 **When you create something in MS Word what is it called?**

Answer : A document.

FAQ - 12 **How do you create a document in Microsoft Word from scratch?**

Answer : In the upper-left corner of the Word program window, click the File tab, and then click New. The New Document dialog box opens. With Blank document selected, click Create.

FAQ - 13 **How do you save a document in Microsoft Word?**

Answer : To save a document for the first time, you can press Ctrl+S, click the Save button on the Quick Access toolbar, or click Save on the File tab. All three options display a dialog box in which you specify a name for the document.

FAQ - 14 **How do you track changes to documents?**

Answer : You can use Word's Track Changes feature to record the changes made to a document. Click the Track Changes button in the Tracking group on the Review tab. Word highlights the button, indicating that the Track Changes feature is turned on.

FAQ - 15 **How do you format text, change font, and font size?**

Answer : To format text, in the Font group on the Home tab, click the Bold, Italic or Underline button. To change the font and font size click on the toolbar. Click the Font arrow to display a list of available fonts. Then click the Font Size arrow to select the size.

FAQ - 16 **What will the following key combination do: Ctrl+P?**

Answer : Ctrl+P will print the document.

FAQ - 17 **How do you check spellings and grammar of a MS Word document?**

Answer : Place the cursor at the beginning of the document or at the beginning of the section that you want to check. Click the Review tab on the tool bar. Click Spelling & Grammar on the Proofing group.

FAQ - 18 **Describe way of creating a new table.**

Answer : Click the Insert tab of ribbons and then click on down arrow of tables and select the number of columns and rows as desire. New table will be inserted.

FAQ - 19 **What is the shortcut keys for creating hyperlink?**

Answer : Create a hyperlink Cntrl +K

FAQ - 20 **How to add foot-node & end note in word?**

Answer : To add foot node, bring the cursor at the end of page where you want to add the foot node than go to main menu click on Reference Option click on Insert Footnotes. Likewise you can add end note by clicking on “Insert endnote”.

FAQ - 21 **When you create something in Excel what is it called?**

Answer : A Workbook.

FAQ - 22 How do you create a spreadsheet in Microsoft Excel from scratch?

Answer : When you start Excel without specifying a document to open you get a blank workbook in a new workbook window. This workbook, temporarily named Book1, contains three blank worksheets (Sheet1, Sheet2, and Sheet3). To begin to work on a new spreadsheet, you simply start entering information in the first sheet of the Book1 workbook window.

FAQ - 23 How do you save a spreadsheet in Microsoft Excel?

Answer : Click the Save button on the Quick Access toolbar or press Ctrl+S; then designate the drive and folder directory where the file should be located.

FAQ - 24 How do you print a spreadsheet in Microsoft Excel?

Answer : First, use the Print Preview feature before you print any worksheet to see exactly how the worksheet data will be paged when printed. You then can click the print icon in the toolbar.

FAQ - 25 How do you format cells in a spreadsheet?

Answer : First, you highlight the entire block of cells you wish to format. You then can either right click the block of cells to format or select one of the formatting buttons on the toolbar.

FAQ - 26 What is meant by cell address?

Answer : Excel worksheet is an array of cells arranged in columns and rows. The columns are marked by alphabets while the rows are numbered. Cell address is the combination of column letter and followed by number of row. If a cell is located in column C and in the row 7, then its cell address is C7.

FAQ - 27 Name the categories of Operator used in Excel?

Answer : There are four categories of operators used in MS Excel, Reference, arithmatic, comparison and text operators.

FAQ - 28 What is a worksheet functions?

Answer : To apply formula in Excel a command name is known as functions. There are many categories of functions. For example to add up values we use “SUM“ function.

FAQ - 29 Can any part of a spreadsheet can be printed?

Answer : Yes any selected part of worksheet function can be printed.

FAQ - 30 What are the components of formula in a cellsof spreadsheet?

Answer : Formula starts with equal sign „=“, then can have function and operators with text or number.

FAQ - 31 When you create something in PowerPoint what is it called?

Answer : A presentation.

FAQ - 32 What type of data can be inserted in slides of Power point.

Answer : You can insert text, tables, which may contain text, graphics, sound, movies, hyperlinks, and other objects.

FAQ - 33 **Can you add animation feature in a power point?**

Answer : This software also enables user to add animation and effects to slideshow elements.

FAQ - 34 **Can the presentation of powerpoint be printed?**

Answer : Presentations can be printed, displayed, notated, and navigated by the presenter.

FAQ - 35 **What is the extension of power point file?**

Answer : The extension of powerpoint file is ppt or pptx.

FAQ - 36 **How do you create a new presentation?**

Answer : You would click the Office button to open the File menu and choose New to display the New Presentation window. Double-click Blank Presentation to open a new presentation based on the blank template.

FAQ - 37 **How do you view your presentation in full screen mode?**

Answer : Click the Slide Show view button to display the slide show starting with the currently selected slide.

FAQ - 38 **How do you save a PowerPoint presentation?**

Answer : Click the Office button and choose Save from the File menu to display the Save As dialog box. Type a name for the document and then click save.

FAQ - 39 **How do you build a slide in a blank presentation?**

Answer : Click the New Slide button to insert a new title and content slide. To change the layout click the arrow on the New Slide button and click another option from the drop-down box to insert a slide with a different layout.

FAQ - 40 **How do you select and apply Theme colors?**

Answer : Go to the Design tab and locate the Themes group. Hover over a theme to see a preview of it in the presentation. Click a theme to apply it to the slides.

Test Yourself

Multiple Choice Questions (MCQs)

1) Name of the screen that recognizes touch input is:
   - **a)** Recog screen
   - **b)** Point Screen
   - **c)** Touch Screen
   - **d)** Android Screen

2) Identify the device through which data and instructions are entered into a computer
   - **a)** Software
   - **b)** Output device
   - **c)** Input device
   - **d)** Memory

3) Computer Monitor is also known as :
   - **a)** DVU
   - **b)** UVD
   - **c)** VDU
   - **d)** CCTV

4) Arrange in ascending order the units of memory TB, KB, GB, MB
   - **a)** TB>MB>GB>KB
   - **b)** MB>GB>TB>KB
   - **c)** TB>GB>MB>KB
   - **d)** GB>MB>KB>TB

5) Which one of these stores more data than a DVD ?
   - **a)** CD Rom
   - **b)** Floppy
   - **c)** Blue Ray Disk
   - **d)** Red Ray Disk

6) The output shown on the computer monitor is called
   - **a)** VDU
   - **b)** Hard Copy
   - **c)** Soft Copy
   - **d)** Screen Copy

7) Eight Bits make up a

a) Byte

b) Megabyte

c) Kilobyte

d) None of these

8) Which one is the result of the output given by a computer

a) Data

b) Instruction

c) Information

d) Excursion

9) Which one of these also known as read/write memory?

a) ROM

b) RAM

c) DVD

d) Hard Disk

10) The printed output from a computer is called

a) Copy

b) Soft Copy

c) Hard Copy

d) Paper

11) What is place to the left of horizontal scroll bar ?

a) Indicators

b) Split buttons

c) Tab stop buttons

d) View buttons

12) Where can you find the horizontal split bar on MS Word screen?

a. On the top of vertical scroll bar

b. On the bottom of vertical scroll bar

c. On the left of horizontal scroll bar

d. On the right of horizontal scroll bar

13) Tabs stop position cannot be the following alignment?

a) Decimal Alignment

b) Center Alignment

c) Bar Alignment

d) Justify Alignment

14) What is the use of bookmarks ?

a) To correct the spellings.

b) To jump to a specific location in the document

c) To ignore spelling mistakes

d) To save alignments as it is.

15) Which feature is used to replace straight quotes with smart quotes as you type ?

a) Auto Correct as you type

b) Auto Change as you type

c) Auto Ignore as you type

d) Auto Format as you type

16) Ctrl + D is short cut used for ?

a) Open Dialogue Box

b) Font Dialogue Box

c) Save as Dialogue Box

d) Save Dialogue Box

17) Ctrl + G is shortcut for ?

a) Open Find and Replace Dialog box with activating Goto Tab

b) Open Find and Replace Dialog box with activating Find Tab

c) Open Find and Replace Dialog box with activating Replace Tab

d) Open Goto Dialog box

18) Ctrl + H is short cut for ?

a) Open Insert Dialog box activating Insert Hyper Link Tab

b) Open Find and Replace Dialog box with activating Go to Tab

c) Open Find and Replace Dialog box with activating Find Tab

d) Open Find and Replace Dialog box with activating Replace Tab

19) What can be searched by find?

a) format

b) characters

c) symbol

d) All of above

20) on which page the header or the footer is printed by default ?

a) on first page

b) on last page

c) on alternate page

d) every page

21) Which of these toolbars allows changing of Fonts and their sizes ?

a) Standard

b) Formatting

c) Options

d) None of above

22) To spell check which function key you will press ?

a) F5

b) F6

c) F7

d) F8

23) How to insert a sound file in word document ?

a) From insert -> sound menu option

b) From insert -> object menu option

c) From insert -> subject menu option

d) From insert -> file menu option

24) How many maximum number of columns can be inserted in the word document ?

a) 45

b) 50

c) 55

d) 65

25) Which file format can be added to a power point show?

a) .jpg

b) .gif

c) .wav

d) All a, b & c

26) In Microsoft PowerPoint to kind of Sound effects files that can be added to the presentation are

a) .wav files and .mid files

b) .wav files and .gif files

c) .wav files and .jpg files

d) .jpg files and .gif files

27) Material consisting of text and numbers is best presented as

a) A table slide

b) A bullet slide

c) A title slide

d) All of the above

28) What is a motion path?

a) A type of animation entrance effect

b) A method of advancing slides

c) A method of moving items on a slide

d) All of above

29) What is a slide title must appear?

a) A title area and text area of specific slide

b) A slide master and title master merged into a single slide

c) A slide master and title master for a specific design templet

d) All of above

30) Which of the following should you use if you want all the slides in the presentation as the same look?

a) The slide layout option

b) Add a slide option

c) Outline view

d) A presentation design templet

31) In the context of animations, what is a trigger?

a) An action button that advances to the next slide

b) An item on the slide that performs and action when clicked

c) The name of a motion path

d) All of above

32) In Order to edit a chart, you can

a) Triple click the chart object

b) Click and drag the chart object

c) Double click the chart object

d) Click the chart object

33) With which of the following all formulas in excel starts?

a) /

b) *

c) $

d) =

34) On an excel sheet the active cell in indicated by?

a) A dotted border

b) A dark wide border

c) A blinking border

d) By italic text

35) What term describes explanatory text attached to a cell?

a) context

b) callout

c) comment

d) dialog

36) How we can view a cell comment?

a) Position the mouse point over the cell

b) Click the comment command on the view menu

c) Click the edit comment commands on the insert menue

d) Click the Display comment command on the window menu

37) Which of these will not select all the cells in a document?

a) Using the edit select all menu

b) Pressing Ctrl+A on the keyboard

c) Clicking three time with the right mouse button in the spread sheet

d) None of these

38) The default style on new data keyed in a new workbook is?

a) comma

b) Normal

c) Currency

d) Percent

39) If you press _____, the cell accept you typing as its contents?

a) Tab

b) Ctrl+Enter

c) Ener

d) Alt+Enter

40) To convert a column of data into row which command will you choose

a) Edit →Past Special →Transpose

b) Cut and paste

c) Both of above

d) None of above

Answers key:

1	C	2	C	3	C	4	C	5	C
6	C	7	A	8	B	9	D	10	C
11	D	12	A	13	D	14	B	15	D
16	B	17	A	18	D	19	D	20	D
21	B	22	C	23	B	24	A	25	D
26	A	27	A	28	C	29	C	30	D
31	B	32	C	33	D	34	B	35	C
36	A	37	C	38	B	39	C	40	A

COMPUTER AIDED DESIGNING (CAD)

Teaching and Learning Guide

Module-2

National Vocational Certificate Level 2

Version 1 - August 2019

Module 2:
Develop 2D Drawings using AutoCAD

Objective:

Objective of this module is to provide skills and knowledge to create 2-dimensional drawings by using various tools and commands. You can create and modify objects and drawings in AutoCAD to meet specific targets according to job requirements.

Learning Outcomes:

After completion of this learning module, you will be able to:

- Develop 2D objects
- Prepare final setup of 2D drawing

Learning Unit 1:
Develop 2D Objects

Objectives

In this learning unit you will learn how to open and save file with desired name and location, interface, create 2D objects and modifying objects. After completion of this learning unit you will be able to understand following.

After completion of this learning unit you will be able to:

- Setup drawing interface for required specifications.
- Setup user interface settings for required specifications.
- Create 2D objects with given measurements.
- Save AutoCAD drawing files in different file formats (e.g. dwg, PDF, JPG).
- Edit 2D objects to meet set standards.

1. Develop 2D Objects

This unit describes fundamentals of AutoCAD 2D. After completion of this learning unit, you will be able to create the new file, prepare drawing, modify, dimension the drawing and save it.

1.1. Setup drawing interface for required specifications.

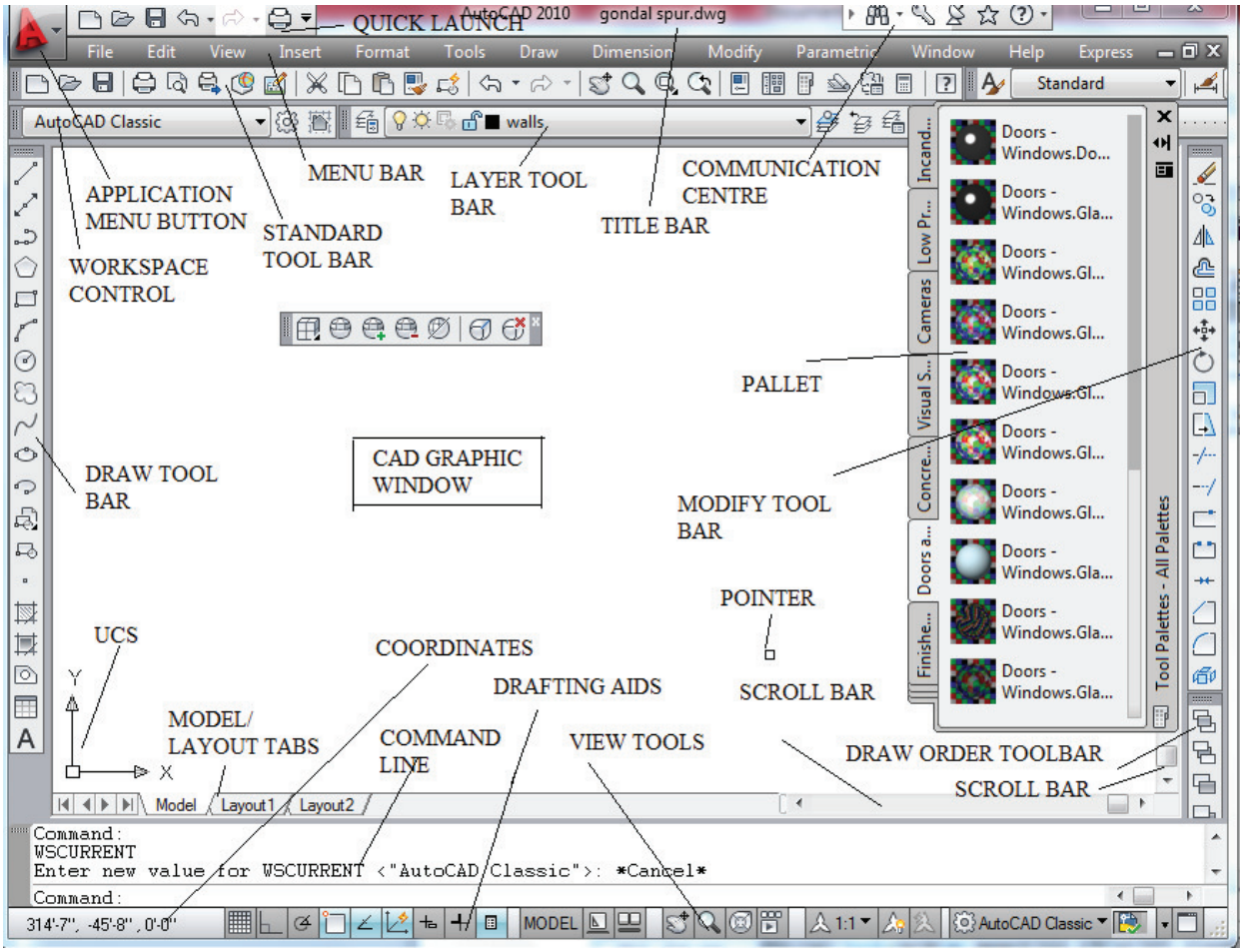
1.1.1. AutoCAD

AutoCAD is Automatic Computer-Aided Drafting and design (CAD), developed and marketed by Autodesk. AutoCAD was first released in December 1982 as a desktop app running on micro computers with internal graphic controllers. Since 2010, AutoCAD is released as a mobile-and web app as well, marketed as AutoCAD 360.
AutoCAD is used in the civil, mechanical, architecture, electrical, electronics and graphic designers.

How to open the AutoCAD software
There are different ways to open AutoCAD software, can be access from windows start button or icon (identification of file, folder or software), short keys.

1.1.1.1. Introduction of AutoCAD workspaces (screen):

The collection of tools displayed after creating or opening a drawing is called a workspace.



Some useful toolbars are discussed here.

- **Title bar**

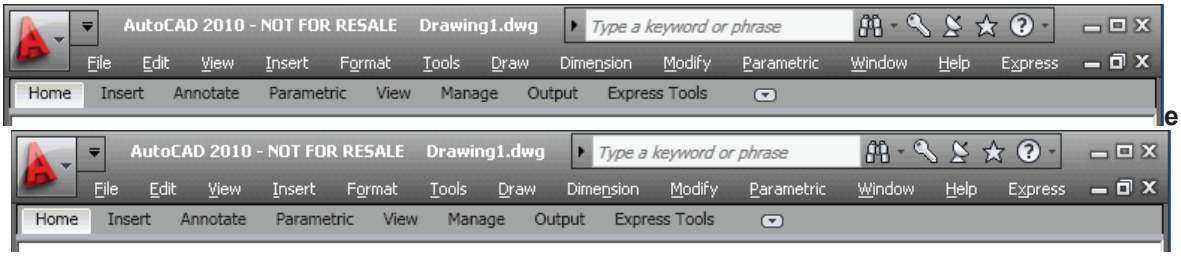
  Title bar is shown on the top of the screen and also include the file name.

- **Quick Access toolbar**

  It is located to the right of application menu and provides immediate access to some of most frequently used commands to complete tasks such as creating, opening, saving ad plotting drawings. The Quick Access toolbar displays options to undo and redo changes to your file, save, print, the most use option can be added in access toolbar.

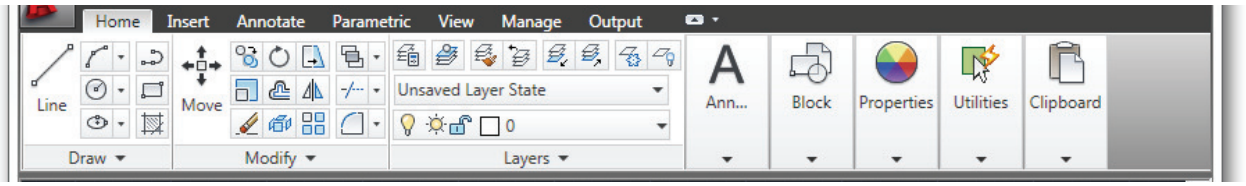
- **Menu Bar or Application Menu**

  Horizontal bar, typically located at the top of the screen below the title bar. It contains drop-down menus, including File, Edit, Insert, Format, Tools, Draw, Dimension, Modify, Parametric, Window, Help and Express.



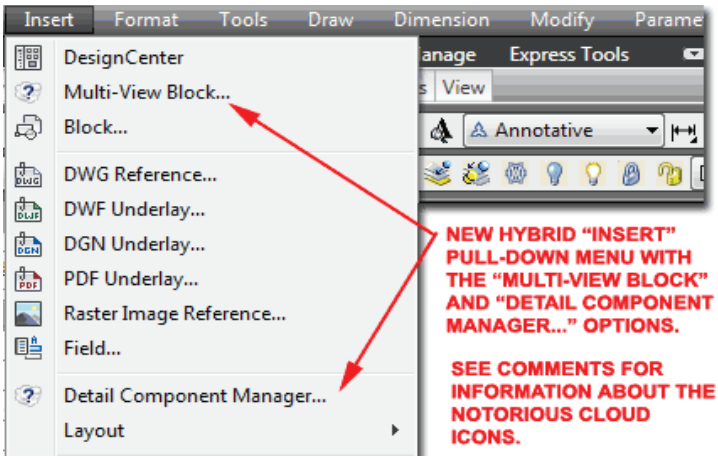
- **Ribbon**

  Ribbon includes different tabs and groups. It is located immediately below the title bar and serves the primary launch pad for nearly every command used to compose drawings in AutoCAD.



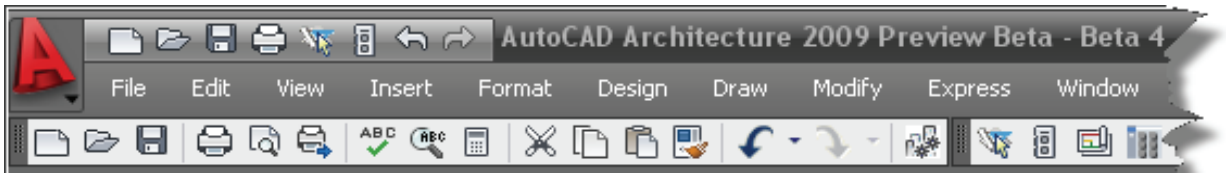
- **Pull down Menu**

  Pull-down menus are displayed as a list under a menu bar

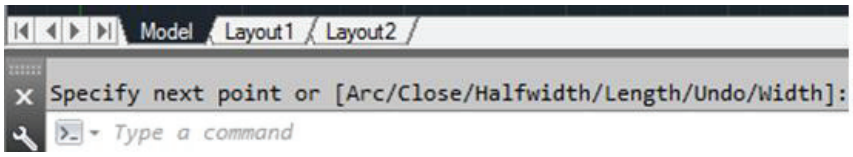


- **Standard Toolbar**

  Standard toolbar is shown below menu bar and includes files like save, print, print view, spelling checking and open files.

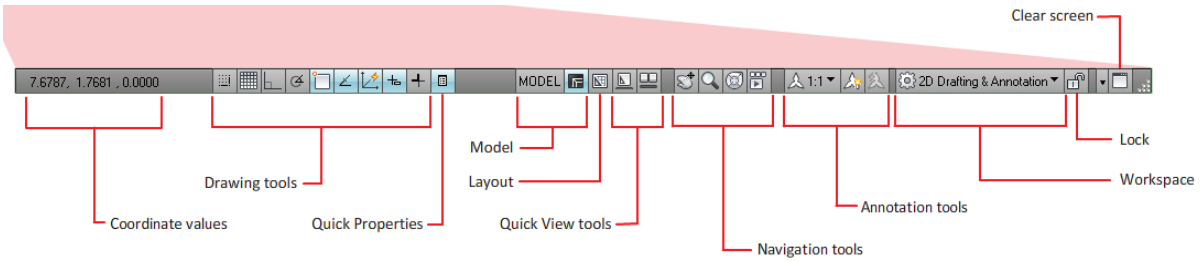


- **Command bar or Command prompt**
  Command line is located in the bottom left corner of the CAD interface. The AutoCAD Command line is like a combined control panel and index of all AutoCAD commands you run



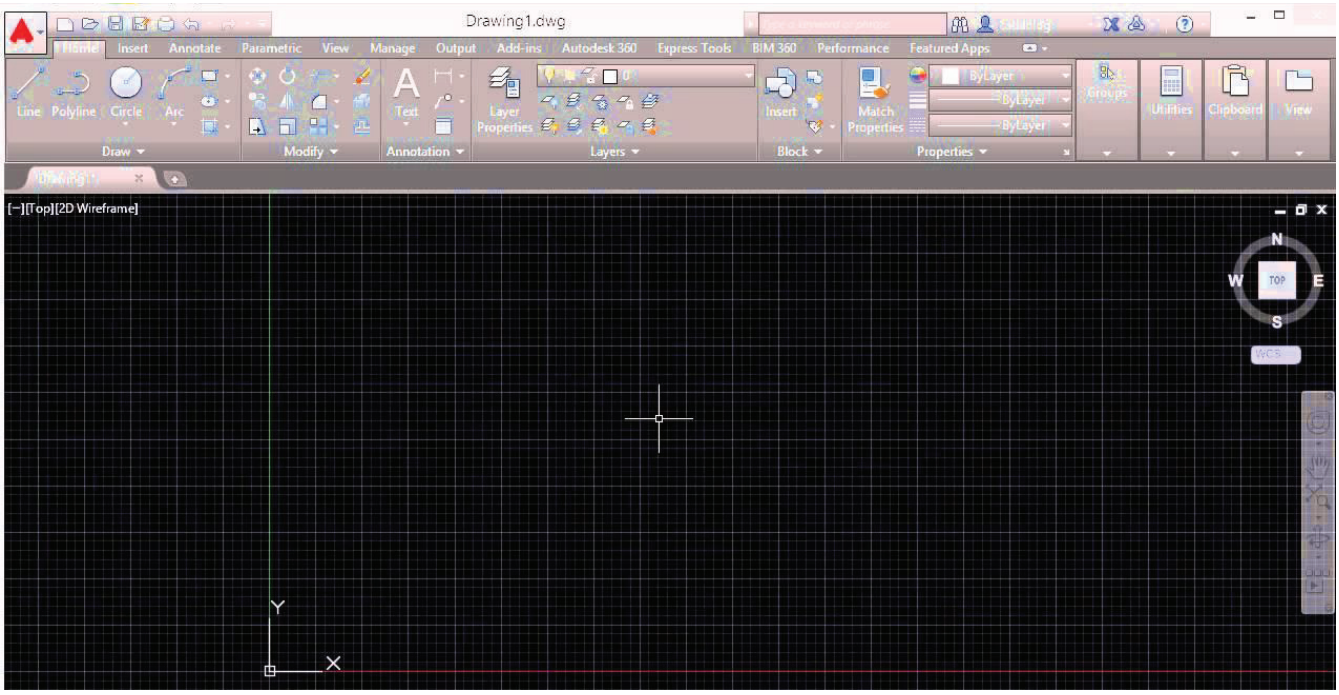
- **Status Bar**

  Status bar is located below the command line and is shown on the bottom of screen. Status bar has different elements, coordinate values, drawings tool, quick properties, models, layouts, quick view tools, navigation tools, annotation tools workspace and clear screen.



- **Working area of AutoCAD**

  In working area, we can do two or three axes of working. In working area mouse cursor shows in different style, crosshair and pic box.



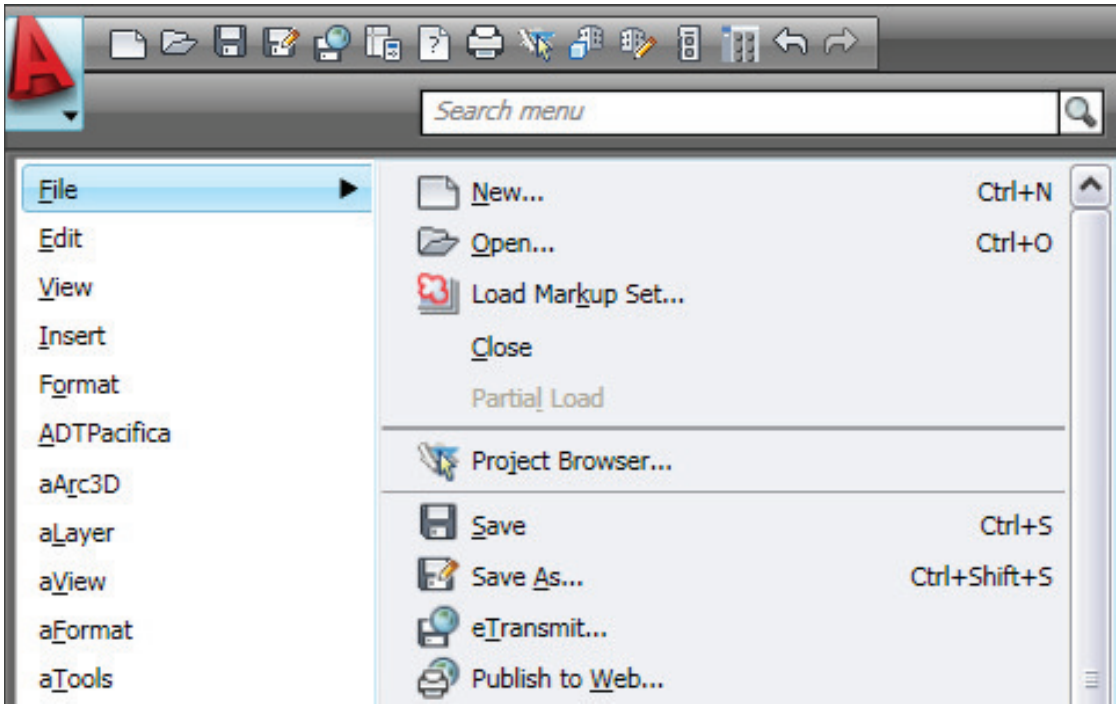
1.1.1.2. Ways to enter the command in AutoCAD

There are four ways to enter the command in AutoCAD those are written below.

i. Menu bar
ii. Tool bar
iii. Command prompt
iv. Short key

- **Command**
  An order to the computer to executes a particular task

- **File menu**
  In file menu some important point that we need to discuss here



- **Create or Open New File**

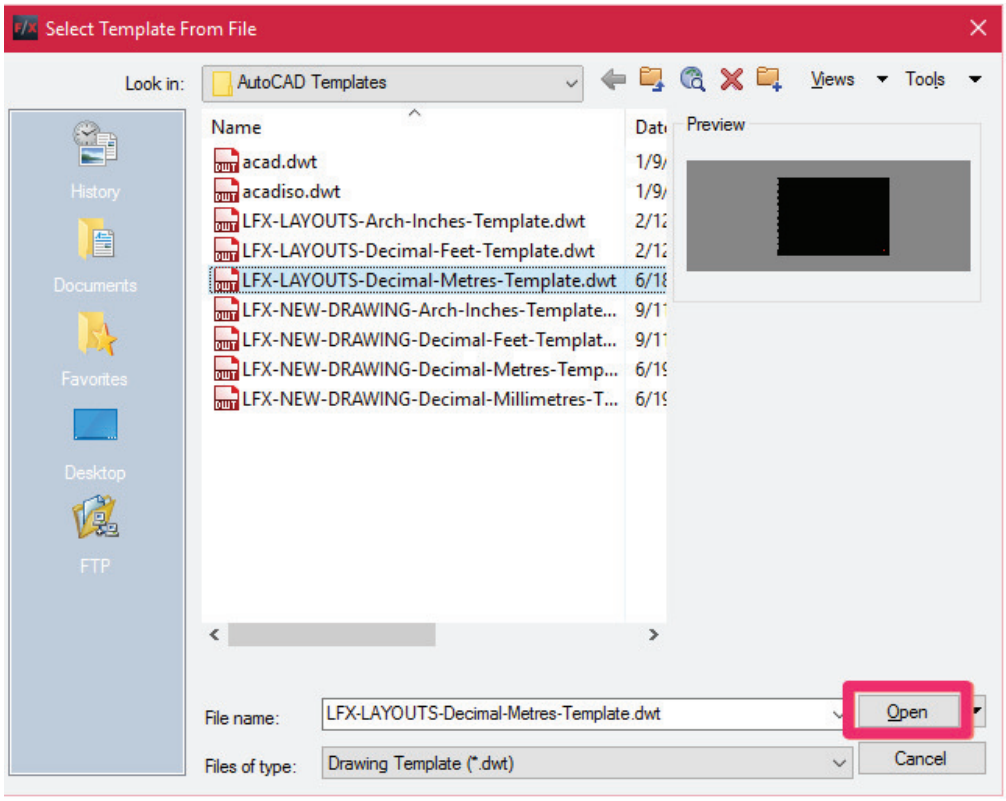
  Create or open new file means to get a new drawing in AutoCAD or learner can also use a template already available in CAD templates library.

- **How to Open templates in AutoCAD**

  Create New Template: Learner can open or create a template by clicking
  File →New → Select Template as shown in the figure.

Do you know?

Templates: is a pre-define layout available in AutoCAD Software which assist the learner.



- **Save the File**
  Save the file before anything is drawn in it as a primary step to secure drawing. There are three methods to save a file.

  Method-1: Through Short Cut Key: Ctrl + S

  Method-2: From Standard tool Bar Click on 

  Method-3: Through File Menu: Click File → save then Name the file and Location where to save

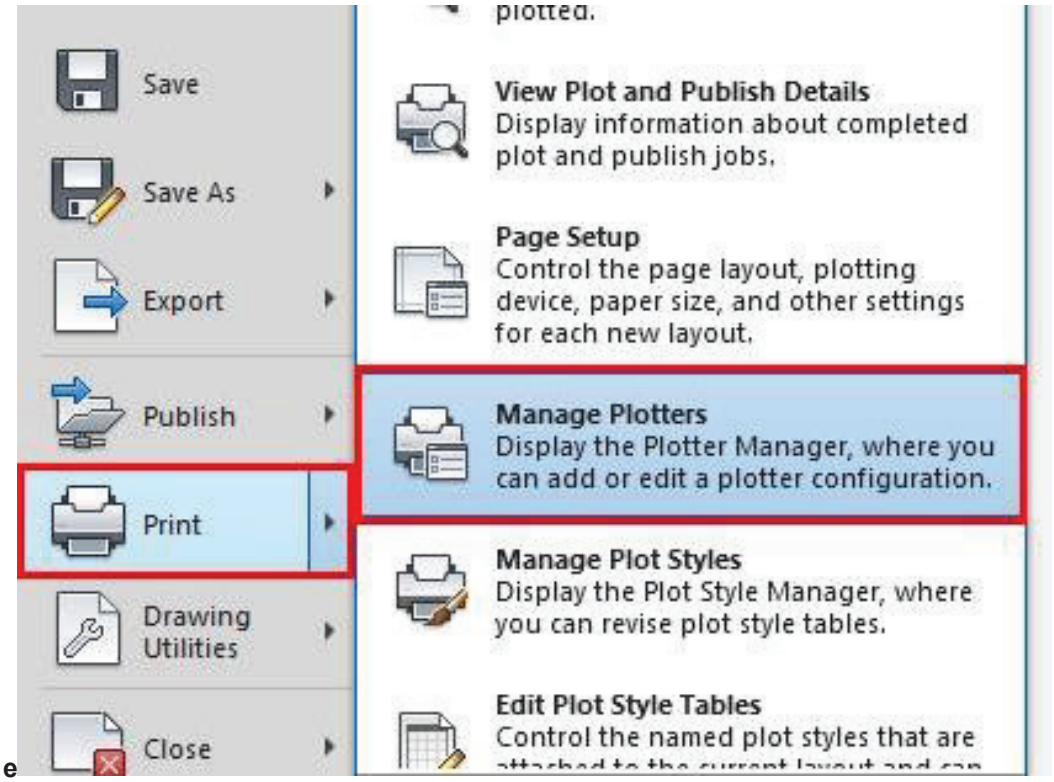
- **Print**
  In print we can print document

  Method-1: Through Short Cut Key: Ctrl + P

  Method-2: From Standard tool Bar Click on 

  Method-3: Through File Menu: Click File → Print/ plot

e



- **Function Keys**
  Learner is able to set and change the limits in inches and millimeter using keyboard function keys. A typical keyboard complete with function key above the alphanumeric keys. These functions keys are labeled F1 through F12 only keys F1 through F11 will be discussed here

F1= Windows Online Help

F2 = Toggle Between Graphic Screen / Text Screen.

F3 = Toggle OSNAP setting dialogue box.

F4 = Toggle tablet mode on or off.

F5 = 3 Iso-plane modes to construct isometric drawing.

F6 = Toggle the coordinates. On/off.

F7 = Toggle the display of Grid on or off.

F8 = Toggle to Ortho mode.

F9 = Toggle Snap mode on or off. The SNAP command sets the current snap value.

F10 = Toggle Polar tracking on or off.

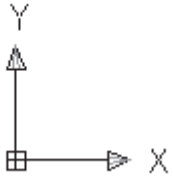
F11 = Object snap tracking on or off. Speakers

1.2. Basic Drawings concepts

1.2.1. Types of Drawing

i. 2-Dimensional drawing
ii. 3-Dimensional drawing

- **2-Dimensional drawing:**
  A physical object in which length and width are real attributes. Any object can be drawn with respect to x and y coordinates.



- **3-Dimensional drawing:**
  A physical object in which length, width, and depth are real attributes—a model, with X, Y, and Z-axes that can be rotated for viewing from different angles

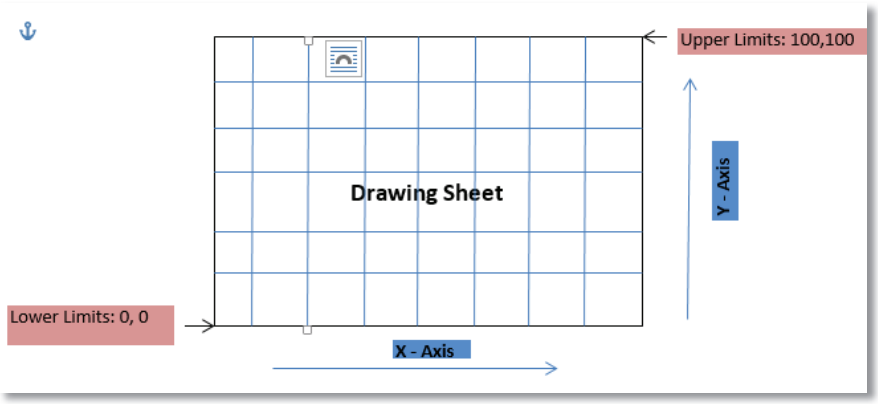
1.2.2. Drawing Limits

Drawing limits are used to set the boundaries of the drawing. The drawing boundaries are usually set to match the size of a sheet of drawing paper. In AutoCAD, setting limits correctly enables you to display the drawing grid over your working area, among other things. When you want to display all grids of limits you have to on Grid element from the status bar.

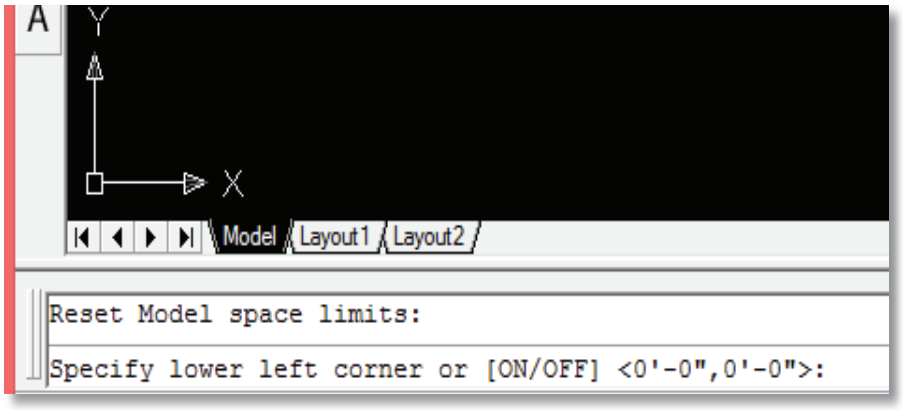
Remember

Limits can be adjusted according to Length type.

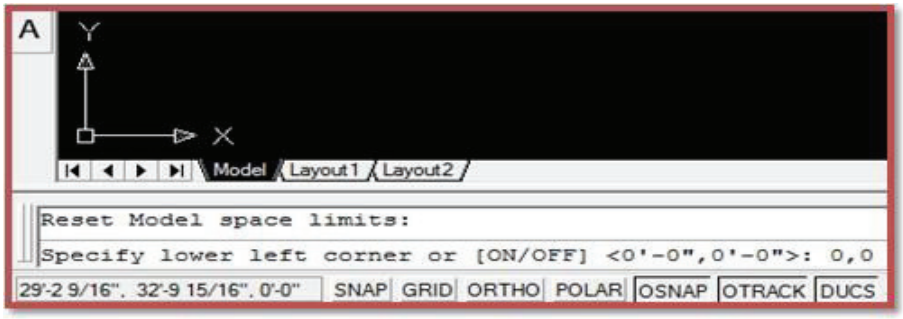
Drawing Limits define drawing sheet with horizontal and vertical coordinates as shown below.



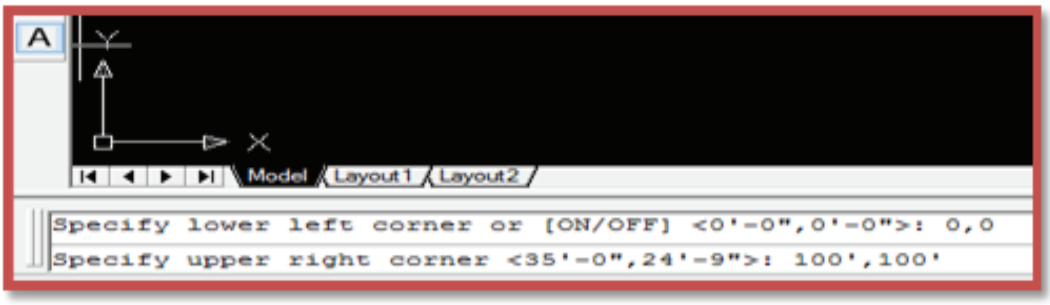
Procedure



Step-1: Type **limits** command in command bar, you will get the following instructions.
Step-2: Define the lower Left corner as 0, 0



Step-3: Define the Upper Right corner as 100-feet, 100-feet.
Step-4: Grid Display: Now you can see the defined limits to On Grid elements in status bar



The table below can be used to compare ISO drawing sheets (based on ISO 216) with to American drawing sheets (based on ANSI/ASME 14.1):

ISO					USA Sizes		
Letter	Width		Length		Letter	inches	mm
	mm	*inches*	*mm*	*inches*			
					F	28.0 x 40.0	
A0	841	33.11	1189	46.81	E	34.0 x 44.0	863.6 x 1117.6
A1	594	23.39	841	33.11	D	22.0 x 34.0	558.8 x 863.6
A2	420	16.54	594	23.39	C	17.0 x 22.0	431.8 x 558.8
A3	297	11.69	420	16.54	B	11.0 x 17.0	279.4 x 431.8
A4	210	8.27	297	11.69	A	8.5 x 11.0	215.9 x 279.4

1.2.3. Unit setting

AutoCAD drawing unit dialogue box allows for either English or metric units to be used as default values. Unit setting is the primary step to set the unit according to the discipline. Unit can be set by using **UN** command in command bar or from main menu through format tab.

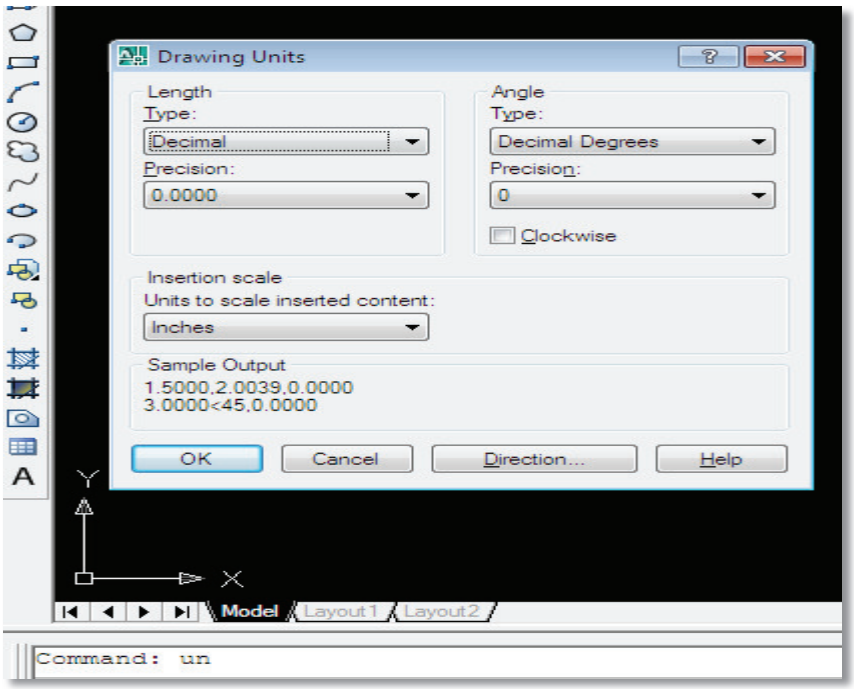
Remember

AutoCAD can work in any of five units; scientific decimal, Engineering, fractional or Architectural

Procedure-1
Format → Units…

Procedure-2
Write UN in command bar to get drawing units dialog box.

.



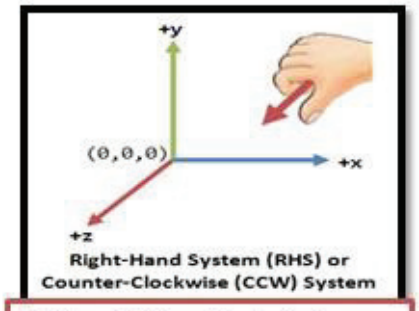
1.2.4. Unit Control

The dialogue box is separated into four main sections.

i. Length type: Which refers to linear units: Like Decimal, Architectural, Engineering etc.
ii. Angles: Referring to angular units
iii. Precision: Precision is used to help a user to specify the precision value is to be needed for the drawing. Ideally precision value varies in terms of number of zeros after the decimal or fraction values. More Zero after decimal more precision will occur in drawing.
iv. Insertion Scale: Selection of different measurement as per length type, like feet or inches for Architectural drawing.

1.2.5. Coordinate System

Real object can be view in 3 dimensions (Width, Length and height), In AutoCAD these 3 dimensions are represented with three Position X, Y and Z axis, is known as the Co-ordinate System.



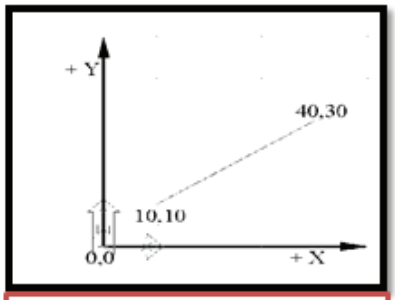
X, Y and Z Coordinate System

- **World Coordinate System:**

  All objects drawn in AutoCAD based on a simple X, Y or X, Y, Z co- ordinate system is known as the World Coordinate System (WC,).

- **Cartesian Coordinate System:**

  A system which define the point draw in a Plan with respect to 2 Axis (X, Y) or 3 Axis (X, Y, Z) in the same unit of length.



X and Y Coordinate System

1.2.6. Entering Point Styles in AutoCAD

This basic technique of making 2D drawing in AutoCAD and let the learner to know about different coordinate systems (Absolute, Relative and Polar Coordinate system).

You can enter points directly on the command line using three different systems.

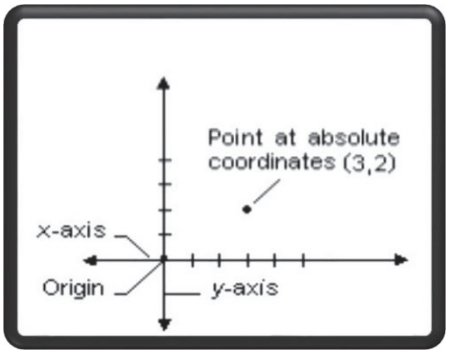
i. Absolute Co-ordinate
ii. Relative Co-ordinate
iii. Polar Co-ordinate

- **Absolute Co-ordinates**

  Coordinates those are defined in terms of their distance from the origin, the point where the axes intersect

  Syntax: X, Y

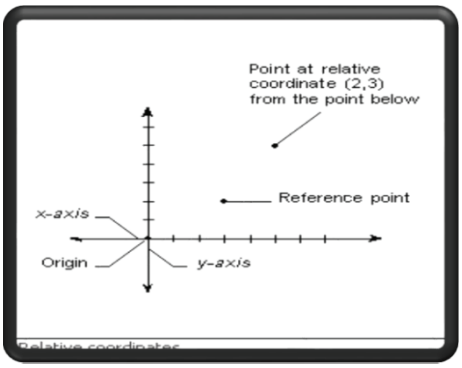
  I.e. only give two values separated by comma.



- **Relative Co-ordinate**

  Coordinates that are defined in terms of their distance from a given starting point, rather than from the origin (intersection of two axes).

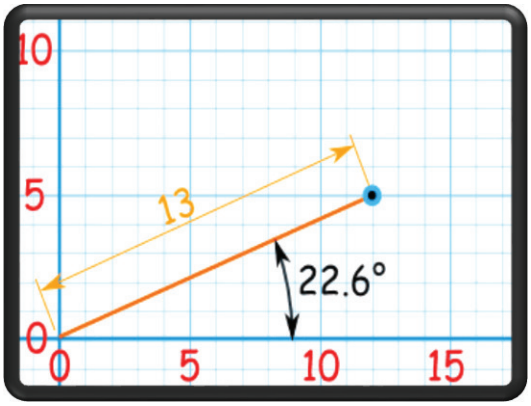
  Syntax: @X, Y



- **Polar Co-ordinate**
  The fixed horizontal line in a system of polar coordinates from which the object is drawn by giving distance with angle.

  Syntax: @distance<angle
  Where Distance=length < = (symbol)
  Angle= to which direction the object is required.

In the Figure the line is drawn under the following command.
@13<22.6 Where Distance= 13, Angle=22.6

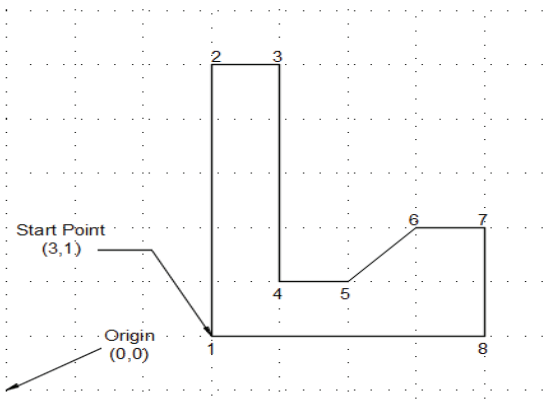


Practice of co-ordinates

- **Absolute Coordinate**

This is the main purpose of using coordinates. The simplest and most Elementary form of coordinate values is Absolute coordinates. Absolute coordinate conform to the following format: (X, Y)

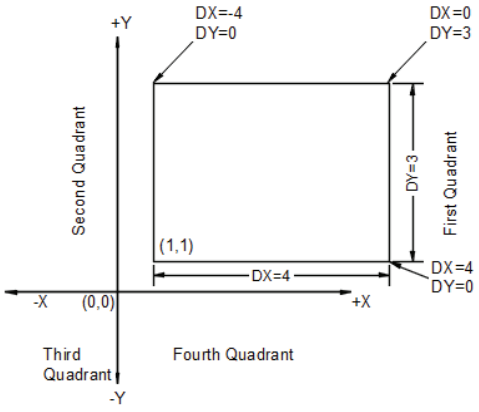
Command: **LINE**
Specify first point: 3,1
Specify next point or [Undo]: <Ortho on> 3,6
Specify next point or [Undo]: 4,6
Specify next point or [Close/Undo]: 4,2
Specify next point or [Close/Undo]: 5,2
Specify next point or [Close/Undo]: 6.3
Specify next point or [Close/Undo]: 7,3
Specify next point or [Close/Undo]: 7,1
Specify next point or [Close/Undo]: c
Command: Regenerating model.



1.2.7. Relative Coordinate Mode to Draw.

The new point would be relative to the pervious point and for this reason this point is called a relative coordinate. Relative Coordinate format is as follows: @X, Y

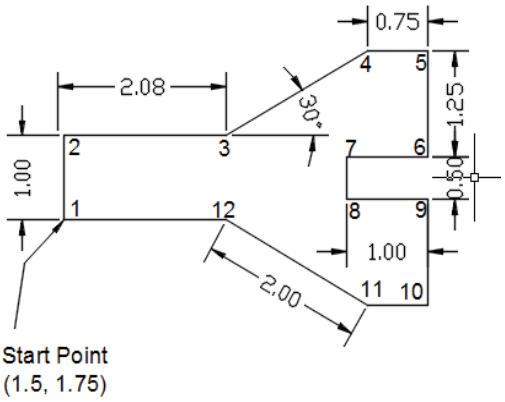
Command: **LINE**
Specify first point: 1,1
Specify next point or [Undo]: @4,0
Specify next point or [Undo]: @0,3
Specify next point or [Close/Undo]: @-4,0
Specify next point or [Close/Undo]: @0,-3
Specify next point or [Close/Undo]: c



1.2.8. Mode to Draw Polar Coordinate

Another popular method of entering coordinates is by polar mode. The format is as following.
@ Distance<Direction
LINE command.
Specify first point: 1.5,1.75
Specify next point or [Undo]: @1.0<90
Specify next point or [Undo]: @2.08<0
Specify next point or [Close/Undo]: @2.0<30
Specify next point or [Close/Undo]: @.75<0
Specify next point or [Close/Undo]: @1.25<-90
Specify next point or [Close/Undo]: <Ortho off>

<Ortho on> <Ortho off>
>>Enter new value for ORTHOMODE <0>:
Resuming LINE Command.
Specify next point or [Close/Undo]: @1.0<180
Specify next point or [Close/Undo]: @.5<270
Specify next point or [Close/Undo]: @1.0<0
Specify next point or [Close/Undo]: @1.25<270
Specify next point or [Close/Undo]: @.75<180
Specify next point or [Close/Undo]: @2.0<150
Specify next point or [Close/Undo]: c



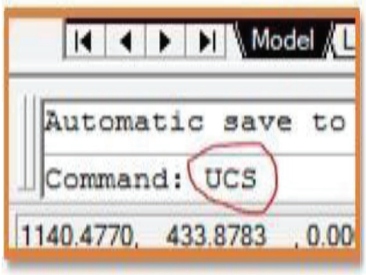
1.2.8.1. User Coordinate System (UCS)

User Coordinate System is a user defined coordinates system that adjusts a Plan for drawing and modeling. User can change the origin according to the object orientation.

- **Procedure**

Method-1: Type UCS in command Bar to View all option of UCS as shown in Figure below:

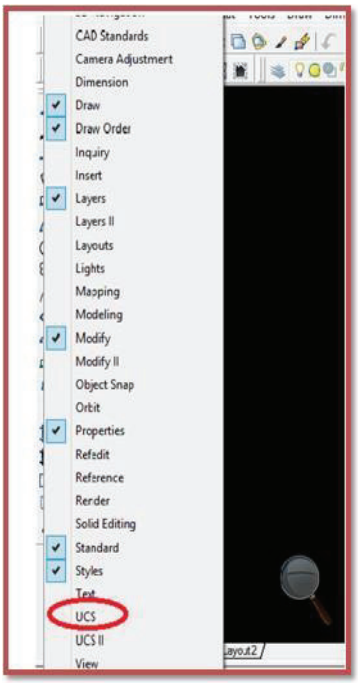
Step-1: Type UCS
Step-2: You will see different UCS option.



Specify origin of UCS or [Face/NAmed/OBject/Previous/View/World/X/Y/Z/ZAxis] <World>:

Method-2: Right Click on the Standard tool bar and select the UCS option within the POPUP Window.

Step-3: You Will See UCS Icon display

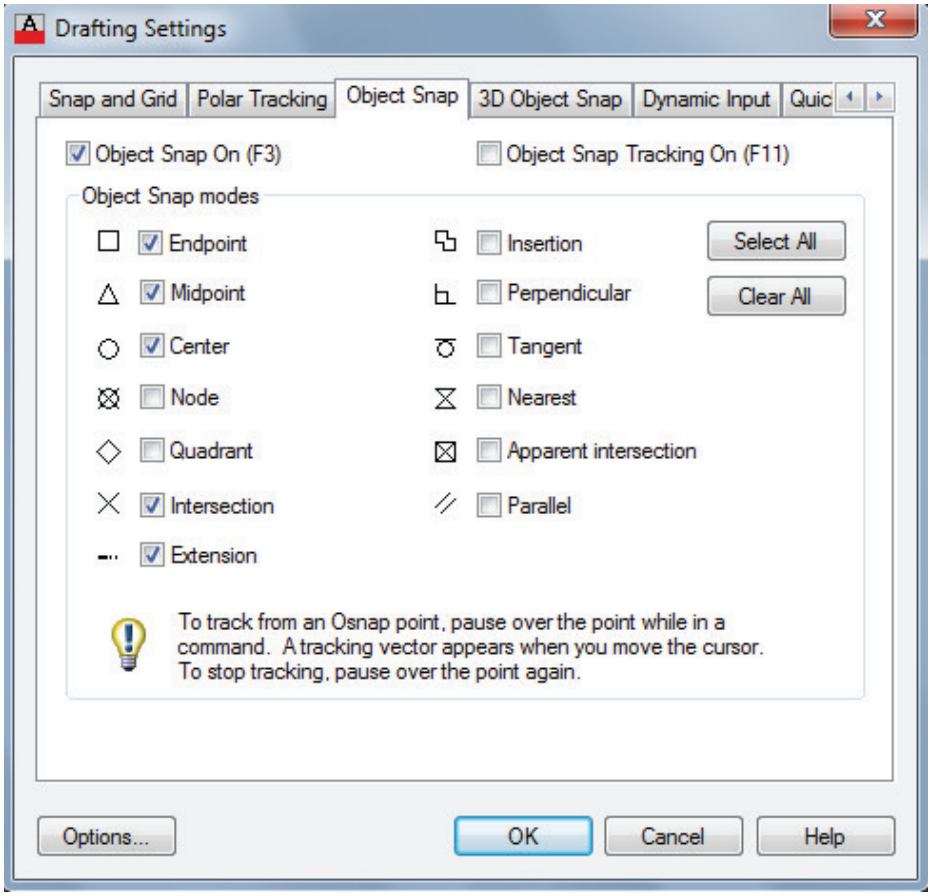


1.3. Setup user interface setting for required specifications.

1.3.1. Drafting setting

Useful command to set grid and snap, polar and object snap tracking, object snap modes, dynamic Input, and quick properties.

- **Type Drafting command in command bar and press enter**
  You will get the following setting.



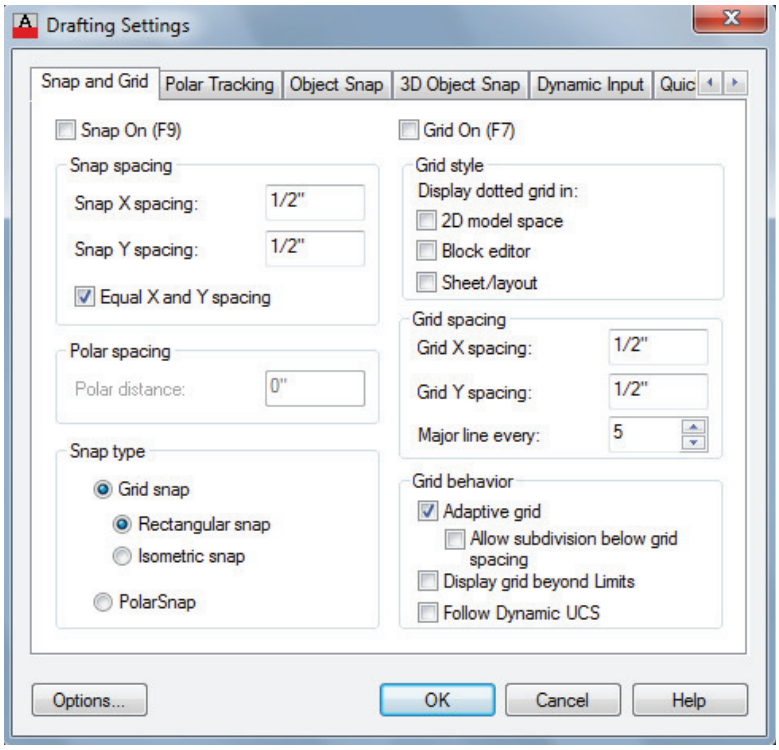
- **Alternate Method to Access**
  You can also access drafting setting by using the following method

  From Menu bar →Tools →Drafting Settings

  Right-click Snap, Grid, Polar, Osnap, Otrack, Dyn or Quick Properties on the status bar. Click Settings.

1.3.2. SNAP setting /DSETTING

It is possible to have the cursor lock onto or snap to a grid. By default, the current snap spacing is 1.00 units. This can be accomplished by using the SNAP Command below or by pressing the F9 function key.



1.3.3. Customizes the display

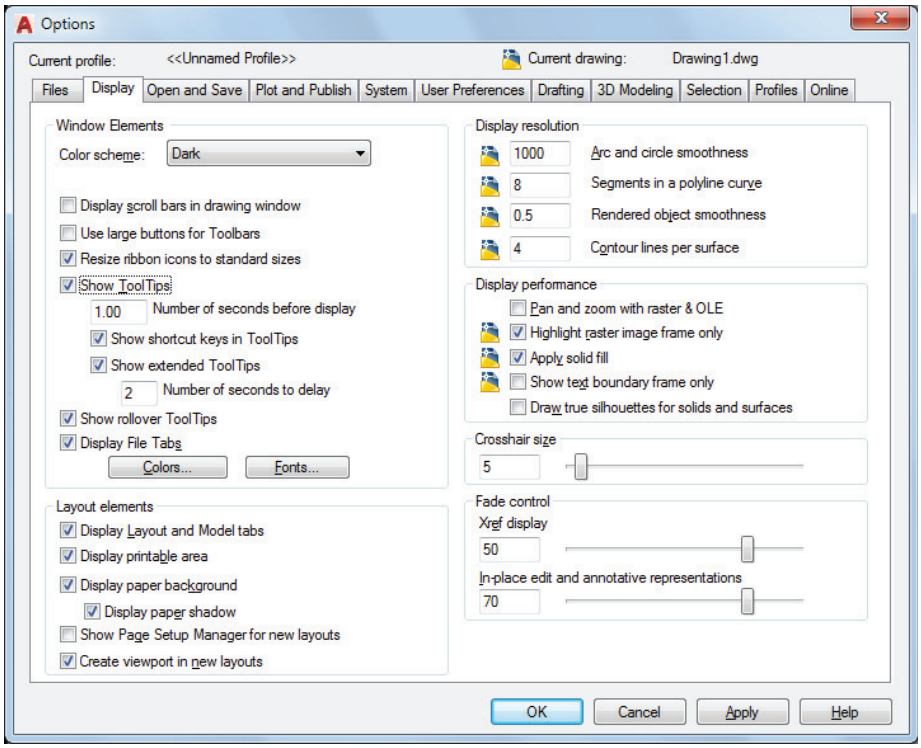
In customize setting we can change AutoCAD windows elements, layout elements, display resolution, crosshair size.

Procedure

To customize the display type OPTION in command line window

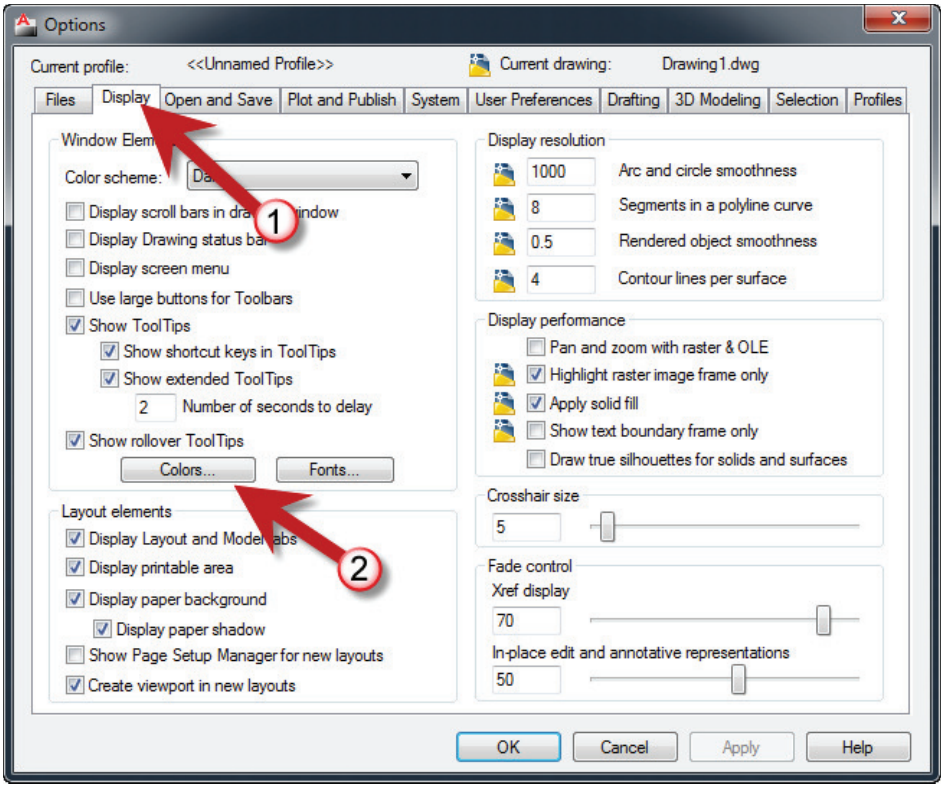
Or

Select from tools menu.
The following dialogue will be shows below.



- **Change in background**
  If you want to change you AutoCAD background colors. Follow the following procedure.

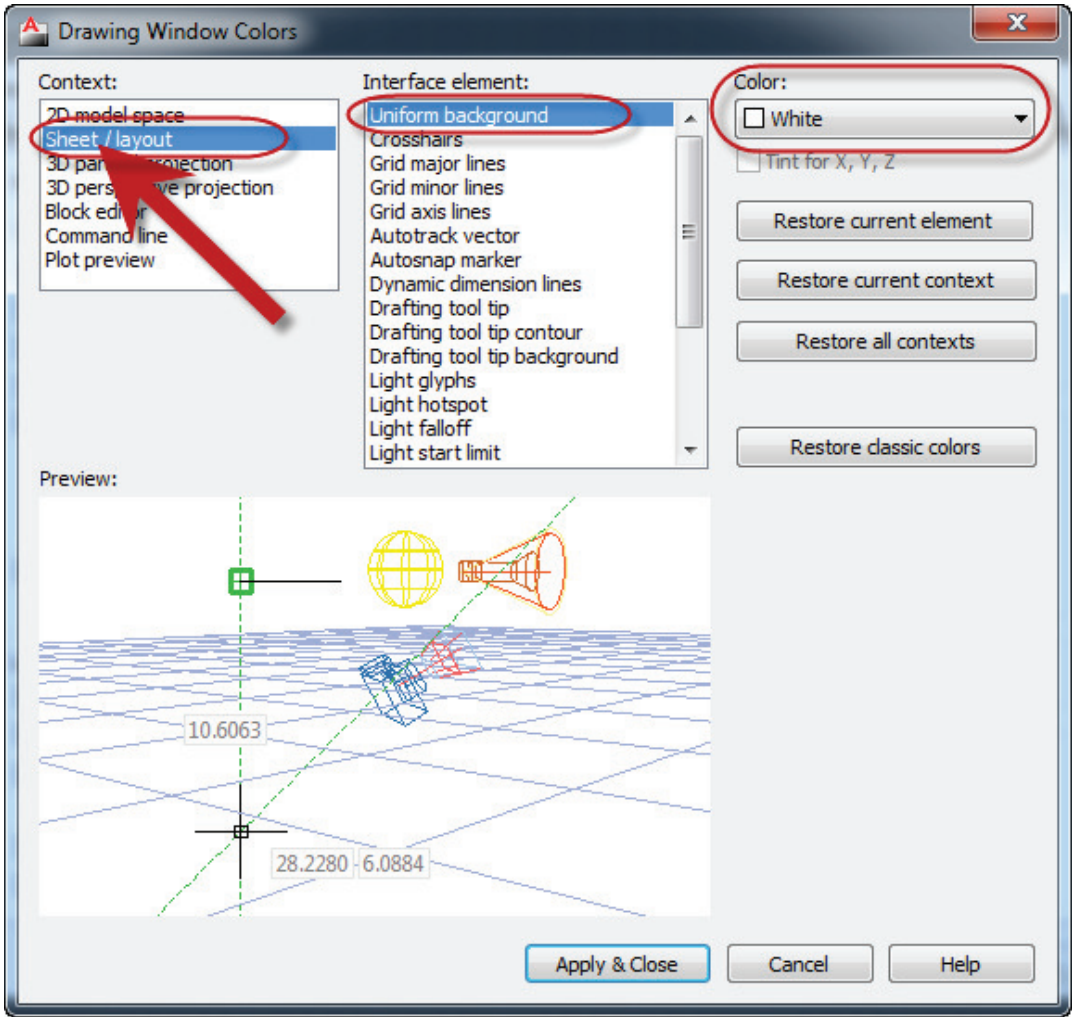
  STEP: 1
  Go to Options →Display→ then select the Color button.

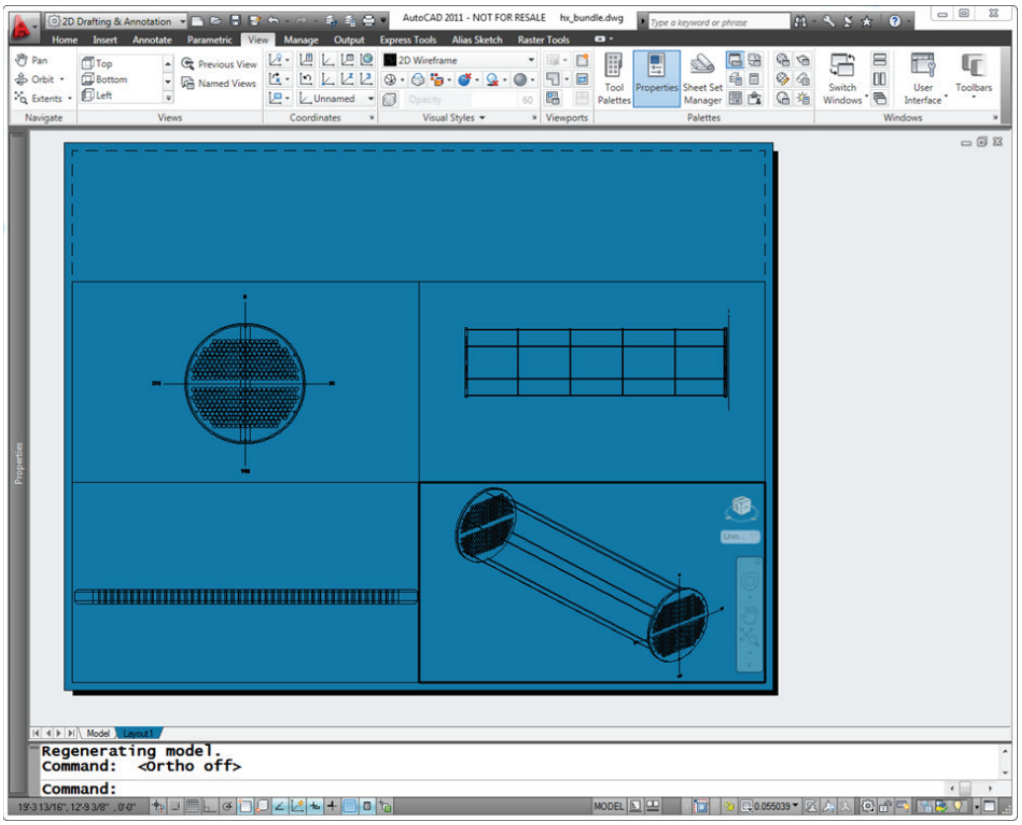


In the Drawing Window Color dialog, you have complete control over the color settings of most everything in AutoCAD.

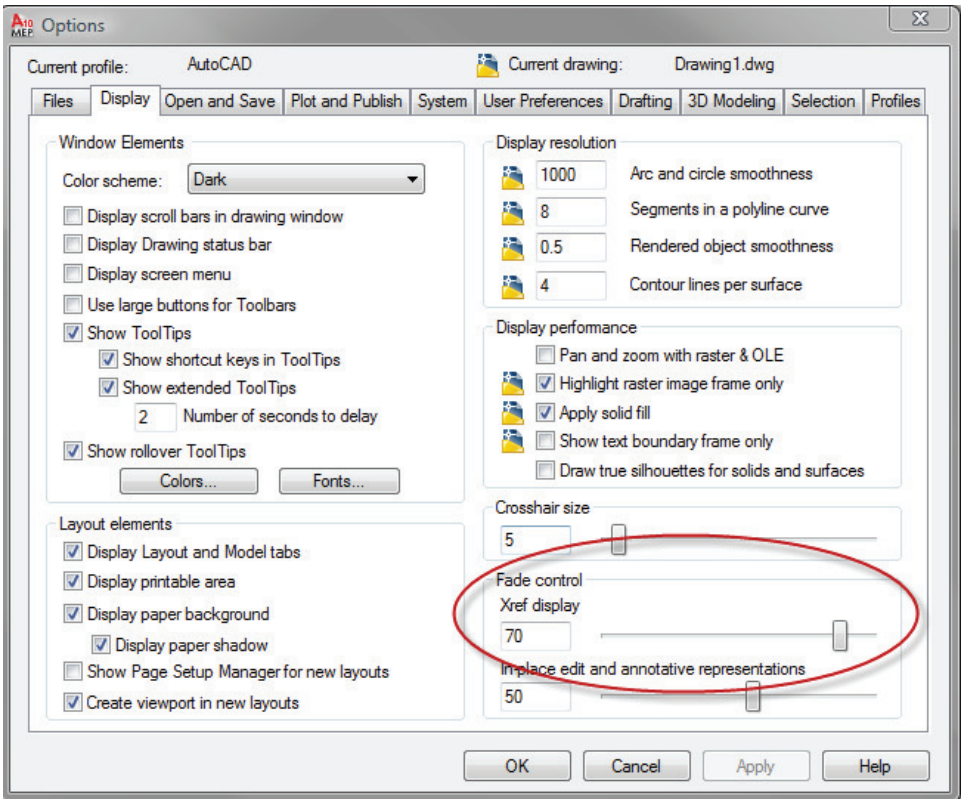
STEP: 2

Select Sheet/Layout → Uniform Background and then set the color you want. Then select Apply & close.





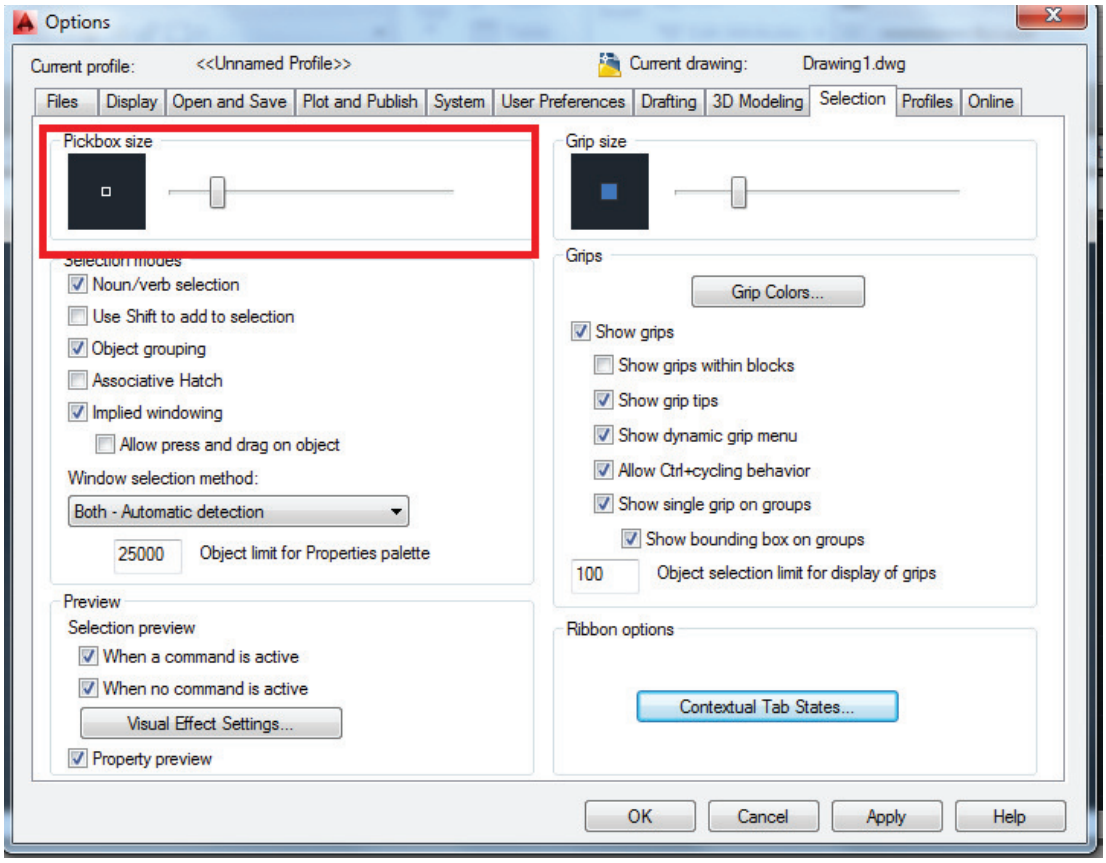
- **To Change the Cursor Size / Crosshair size**
  Go to Options→ Display → then crosshair size.



To Change the Pickbox Size & Grip size

Procedure

Go to Options→ Selection → then Pickbox size and Grip size.

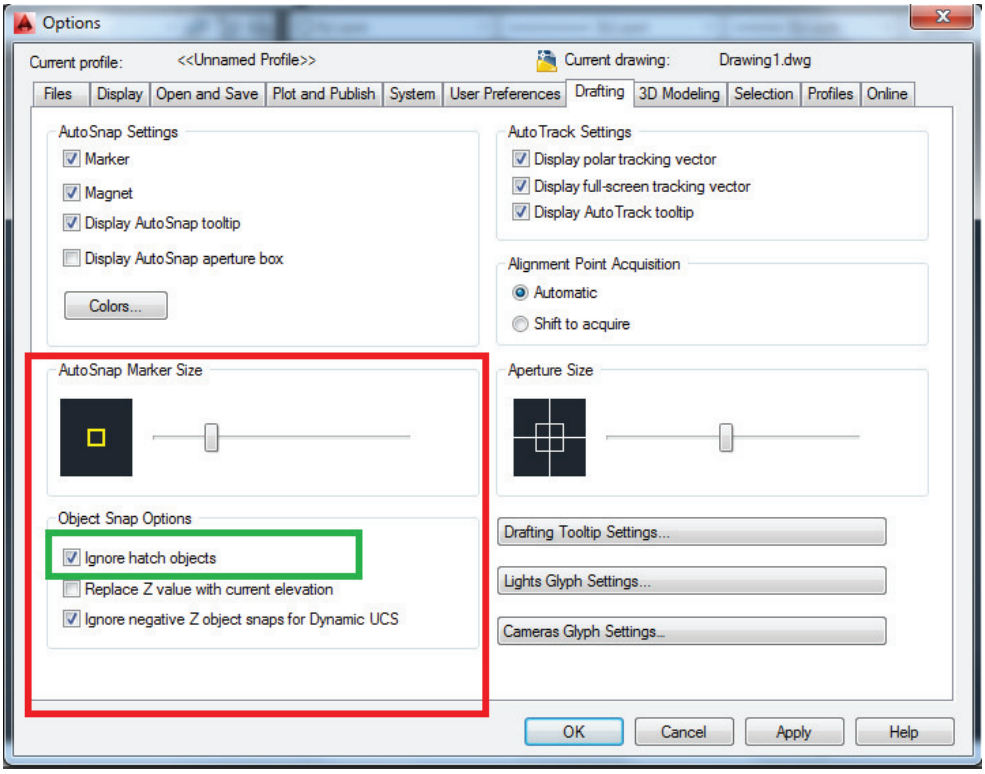


- **To Change the Pickbox Size & Grip size**

  Procedure

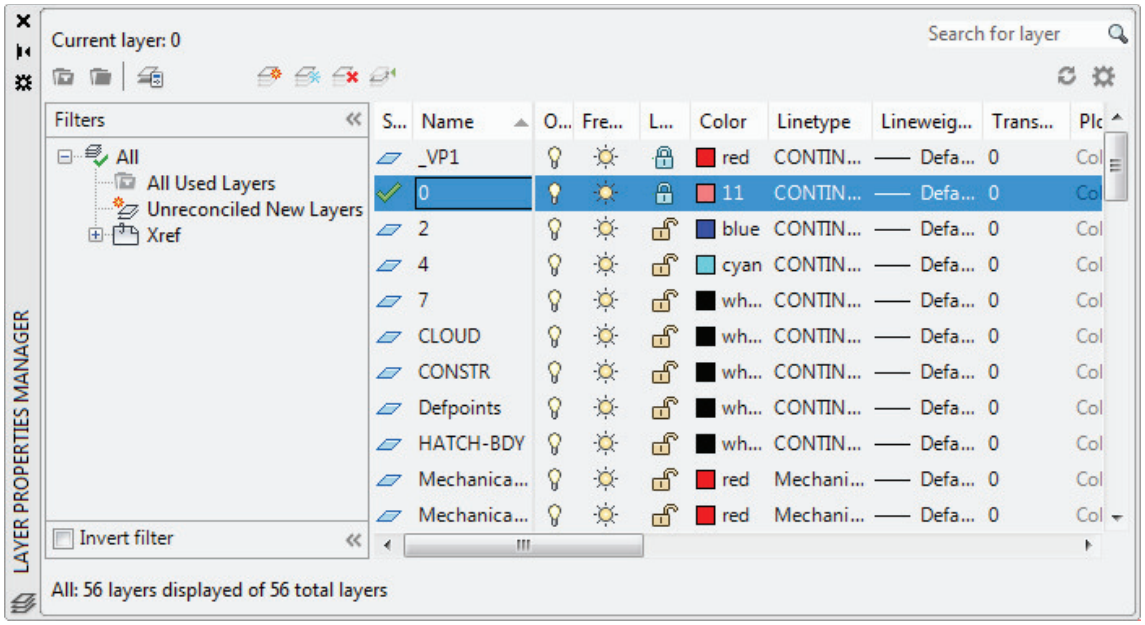
  Go to Options→ Drafting → then AutoSnap marker size.

  -



1.3.4. Layers

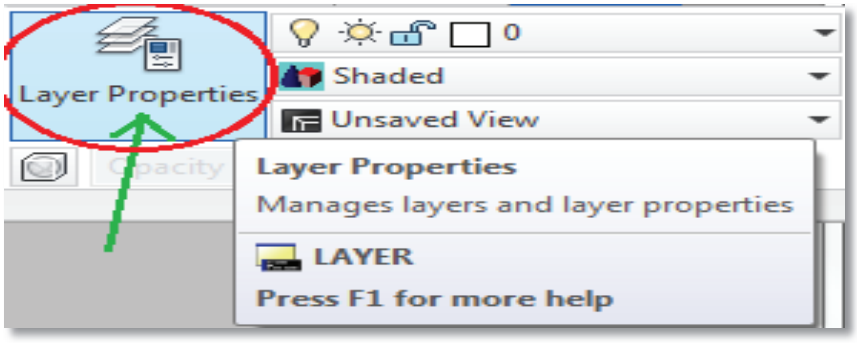
A layer is like a clear/ transparent piece of paper that you can lay directly over the drawing. You can draw on the layer and see through it to the original drawing. As a means of organizing objects, a series of layers should be devised for every drawing. Layers can be thought of as a group of transparent overlays that combines to from the completed drawing



- **Learner is able to learn that how to create new layers properties like**
  Name, On / off, Freeze, Lock, Color, Line type, Line Wight, Transparency, Plot Style, Plot
  New VP Freeze, Description

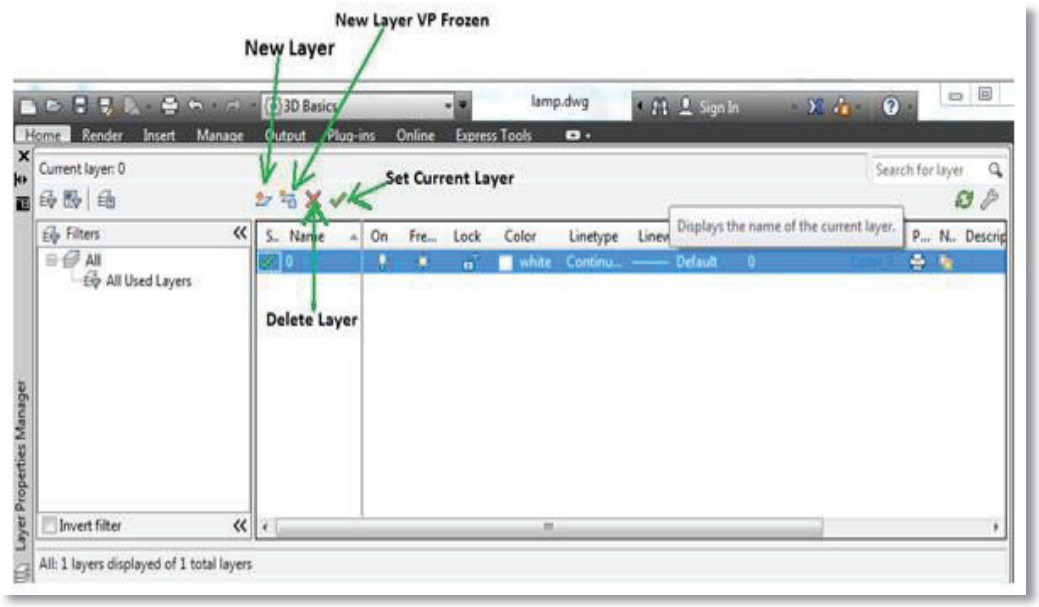
- **How to Create a New Layer in AutoCAD**
  Step-1:
  Type LA at the command line and then press Enter or Click the Layer Properties button in the Layers panel on the Home tab of the Ribbon. The Layer Properties Manager palette appears. A new drawing has only one layer: Layer 0 (zero). You need to add the layers necessary for the drawing.

  Step-2:
  Click the New Layer button: A new layer appears. AutoCAD names it Layer1 but highlights the name in an edit box so that you can type a new name to replace it easily.



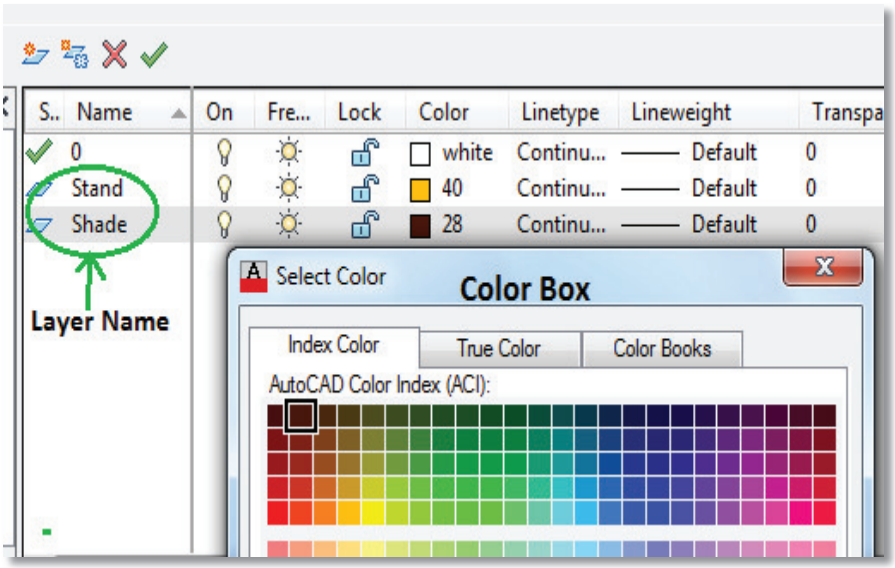
Step- 3:

Type a name for the new layer.



Step-4:

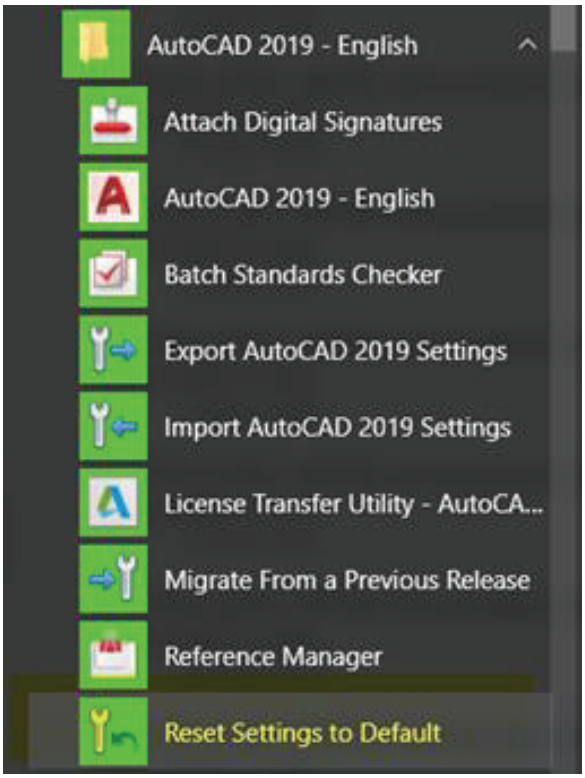
On the same line as the new layer, click the color block or color name (by default, the same as the current layer) of the new layer. You can select any color from the color dialog box appears.



1.3.5. How to Reset AutoCAD Defaults

How to reset or restore the settings of AutoCAD, AutoCAD LT, AutoCAD for Mac, or other AutoCAD-based product to original default values. Most versions of AutoCAD have a reset utility to accomplish the task. Those that do not must follow the manual reset process.
Run the app named Reset Settings to Default, located alongside AutoCAD in the list of all applications accessed from the Windows Start menu. For example:

i. Windows 10: Start > AutoCAD 20xx > Reset Settings to Default
ii. Windows 8: Search for 'reset settings to default' under the Start Screen.
iii. Windows 7: Start > All Programs > Autodesk > AutoCAD 20xx > Reset Settings to Default



1.4. Create 2D objects

Before creation of drawing we must know about its menus, tools, and operation.

1.4.1. AutoCAD Menu

There is different menu in AutoCAD that are displayed when we open the software.

i. File Menu
ii. View Menu
iii. Insert Menu
iv. Format Menu
v. Tools Menu
vi. Draw Menu
vii. Modify Menu
viii. Parametric menu
ix. Windows menu
x. Help menu
xi. Express menu

- **File menu**

Sr. No.	Operation	Uses	Short-key
1	**New**	How to open new file	**Crtl + N**
2	**Open**	Open already saved file	**Crtl + O**
3	**Save**	Save the file	**Crtl + S**
4	**Save As**	specify the name and location for saving	**Crtl + Shift + S**
5	**Close**	Close the current drawing file.	**Crtl + F4**
6	**Plot**	To print a drawing	**Crtl + P**
7	**Exit**	To close or exit a program	**Crtl + Q**

- **Edit Menu**

  There are some edit menu options that are listed below

Sr. No.	Operation	Uses	Short-key
1	**Undo**	Erases the last change done	**Crtl + Z**
2	**Redo**	To reverse your last action	**Crtl + Y**
3	**Cut**	To cut the selected drawing	**Crtl + X**
4	**Copy**	To copy the selected drawing	**Crtl + C**
5	**Paste**	To Paste the copy drawing	**Crtl + V**
6	**Delete**	To delete the selected drawing	**Del**
7	**Select All**	To Select all drawing	**Crtl + Q**

- **View Menu**

  There are some view options in menu bar

Sr. No.	Operation	Uses
1	**Zoom**	To view the drawing larger or smaller
2	**Pan**	Shifts the view without changing the viewing direction
3	**Ariel view**	Displays the entire drawing; the current view is marked with a wide outline box.
4	**Clear Screen**	To remove or clear the drawing
5	**View Port**	To display the some dawings parts
6	**3D view**	To view three dimension view
7	**Rander**	To create the raster image

- **Insert Menu**
  There are some insert options in menu bar

Sr. No.	Operation	Uses
1	**Block**	To insert the drawing
2	**External Reference**	To insert another into drawing
3	**Layout**	Create a new layout/ paper space

- **Format menu**

Sr. No.	Operation	Uses
1	**Layer**	To make drawing in required layer
2	**Color**	To fill the required color
3	**Line type**	To select the line type as required
4	**Line weight**	To select the line weight
5	**Scale**	To select the drawing scale
6	**Text style**	To specify the text style
7	**Dimension style**	To specify dimension style
8	**Table Style**	To make table required style
9	**Point Style**	Fix the point style
10	**Unit**	To set drawing measuring units

- **Tools Menu**

Sr. No.	Option	Uses
1	**Spelling**	To check or correct spelling mistakes
2	**Draw order**	To View different parts of drawing as required
3	**Inquiry**	To take measurement of drawing
4	**Calculator**	For calculations
5	**Macro**	To record macro

- **Draw menu**

Sr. No.	Operation	Uses
1	**Line**	**To draw the line**
2	**Ray**	**To Ray line**
3	**Polygon**	**To make polygon**

4	**Rectangle**	**To make rectangle**
5	**ARC**	**To draw the arc**
6	**Circle**	**To draw the circle**
7	**Table**	**To insert the table**
8	**Hatch**	**To inert different style of hatch**
9	**Text**	**To draw the text**
10	**Solid**	**To draw the solid drawing**

- **Dimension menu**

Sr. No.	Operation	Uses
1	**Linear**	**To place a linear dimension**
2	**Aligned**	**To place an aligned dimension**
3	**Radius**	**To place a radius dimension**
4	**Diameter**	**To place a diameter dimension**
5	**Angular**	**To place an angular dimension**

- **Modify menu**

Sr. No.	Operation	Uses
1	**Erase**	To erase the lines or drawings
2	**Copy**	To make duplicate of lines or drawings
3	**Mirror**	To Flip a lines or drawings parts
4	**Offset**	To take offset
5	**Array**	To create the objects, copy in a required pattern
6	**Move**	To move selected object
7	**Rotate**	To rotate selected object
8	**Trim**	To cut the extra edges
9	**Fillet**	To make round in line corner
10	**Break**	To create breaks/ distribute into two parts of line/ arc

- **Express menu**

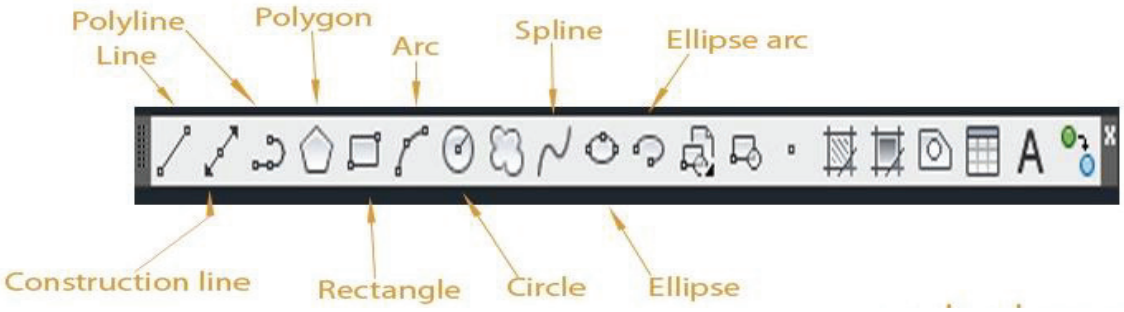
Sr. No.	Option	Uses
1	**Layers**	To view the layered drawings and changing
2	**Block**	TO Make or change the block in drawings
3	**Text**	Change the text style
4	**Layout**	To set the line spacing of drawing
5	**Dimension**	To set different style in dimension
6	**Modify**	To make changing in drawings that save already
7	**Draw**	To show break line

- **Window Menu**

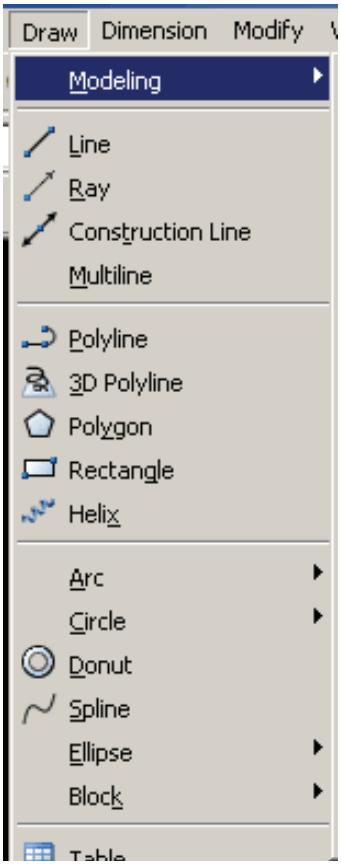
Sr. No.	Option	Uses
1	**Close**	To Close window
2	**Close All**	To close all opened windows
3	**Cascade**	Re-arrange the opened windows

In creation of 2D objects, different AutoCAD commands/ tool bars are explained below

- **Draw toolbar**



1.4.2. Draw Menu bar



1.4.2.1. Line

Line Command is used to draw straight lines between two defined points.

Remember

There are six types of lines using drafting AutoCAD.

Draw Manu	Draw Toolbar	Command Entry
Line		Line/L

How to draw a line

Step-1: Type L in command Bar

Step-2: Line Specify First Point: 0, 0 and Press Enter

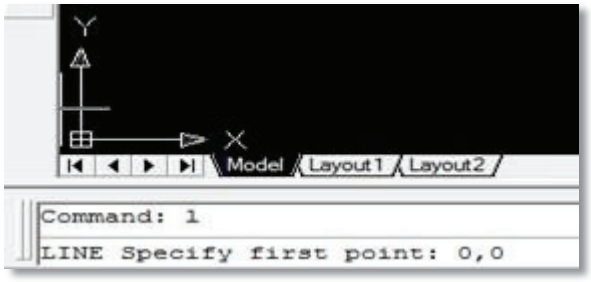
Step-3: Line Specify Next Point: 5, 10 and Press Enter

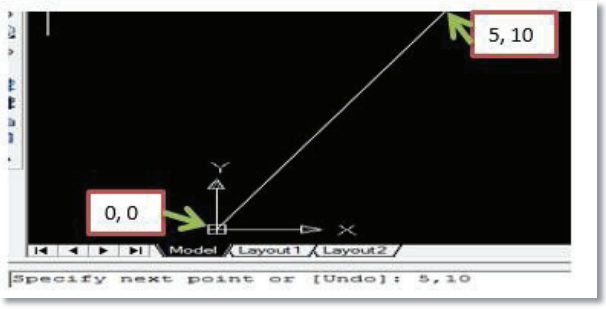
Remember

Line (0, 0)

X, Y is a 2D Coordinates

X,Y Define First point as an Origin





1.4.2.2. Draw polyline

A single object that is composed of line and arc Segments.

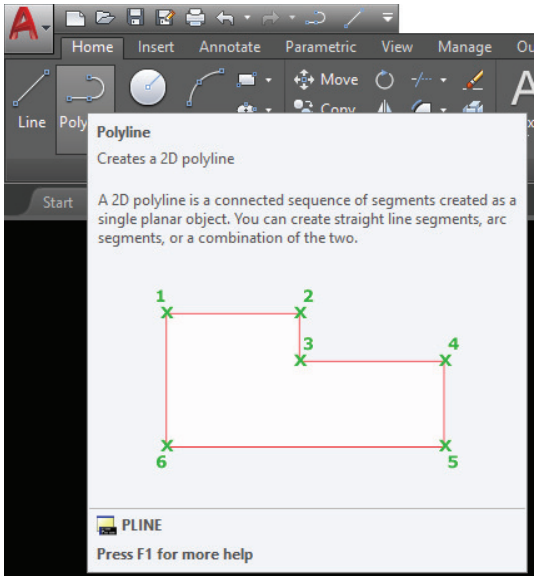
Draw menu bar →PolyLine →click on icon

Or

Short key

PL → Enter

The following message will be displayed in command line



Command: PL

PLINE

Specify start point: Select the point on the graphic window e.g. 2,2 enter key

Following message will be displayed in command line

Current line-width is 0'-0"

Specify next point or [Arc/Halfwidth/Length/Undo/Width]:

To respond the message, give your options as per requirements as under.

Arc: To draw the Arc type A and press enter

Halfwidth: To draw the halfwidth type H and press enter

Length: To draw the Arc type L and press enter

Undo: To draw the Arc type U and press enter

Width: To draw the Arc type W and press enter

1.4.2.3. Draw spline

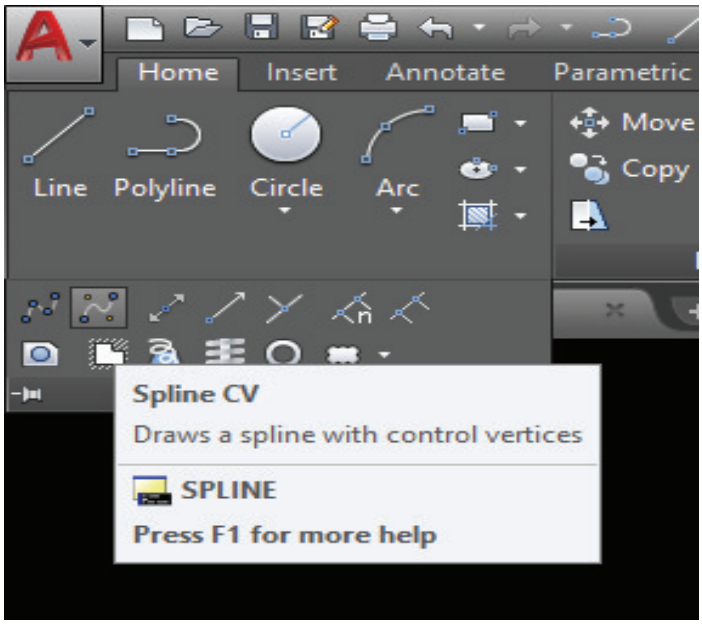
Creates a smooth curve that passes through or near a set of fit points, or that is defined by the vertices in a control frame.

Draw menu bar → Spline → click on icon

Or

short key

SPL → Enter

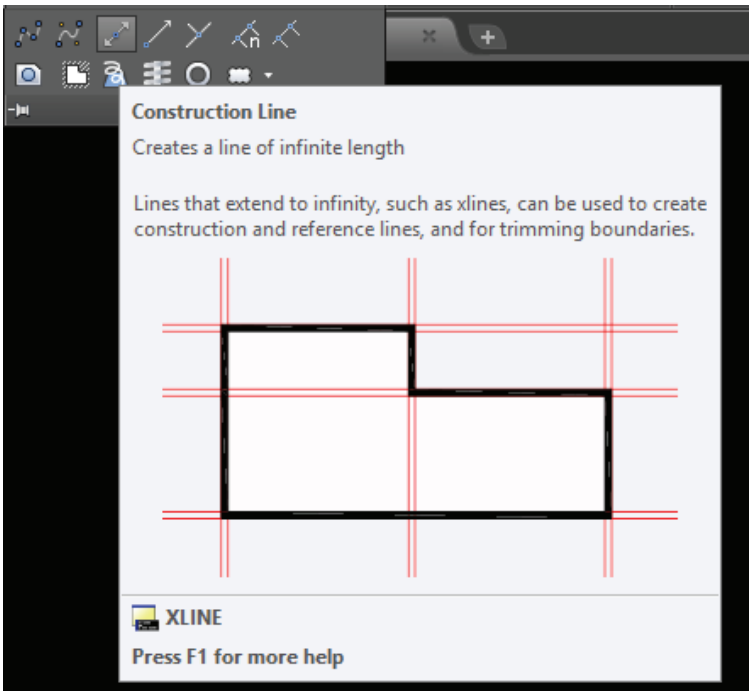


Command: SPL
SPLINE
Following message will be displayed in command line
Specify first point: Select the point on the graphic window e.g. 2,6, enter key
Current settings: Method=Fit Knots=Chord
Specify first point or [Method/Knots/Object]:
To respond the message, give your options as per requirements as under

i. **Method:** Controls whether the spline is created with fit points or with control vertices
ii. **Knots:** Specifies the knot parameterization, one of several computational methods that determines how the component curves between successive fit points within a spline are blended. (SPLKNOTS system variable)
iii. **Object:** Converts 2D or 3D quadratic or cubic spline-fit polylines to equivalent splines.

1.4.2.4. Draw construction line

Creates a construction line of infinite length.
Draw menu bar → construction Line → click on icon
Or short key
XL → Enter



Command: XL or XLINE

Following message will be displayed in command line

Specify start point: Select the point on the graphic window e.g. 2 enter key

Specify a point or [Hor/Ver/Ang/Bisect/Offset]:

Hor (Horizontal): Draw the horizontal line

Ver (Vertical): Draw the vertical line

Ang (Angle): Draw the angle line

Bisect: Bisect an angle define by a vertex and two end points.

Offset: Draw construction line in offset.

1.4.2.5. Draw Ray line

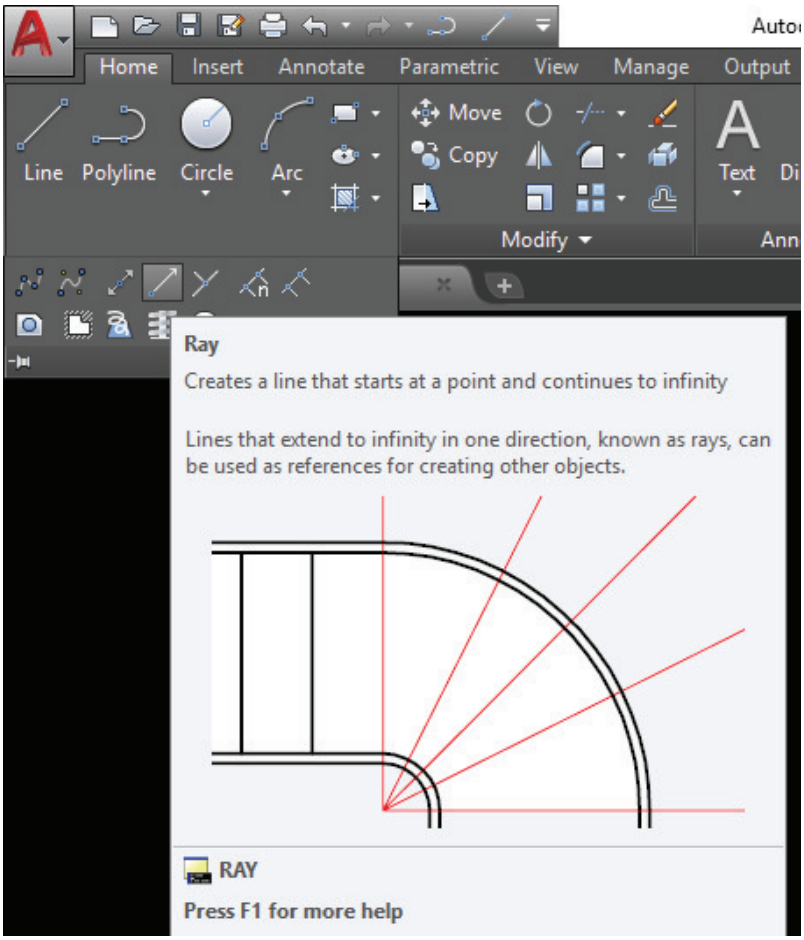
Creates a linear object that starts at a point and continues to infinity

Draw menu bar → Ray Line →click on icon

Or

short key

Ray →Enter

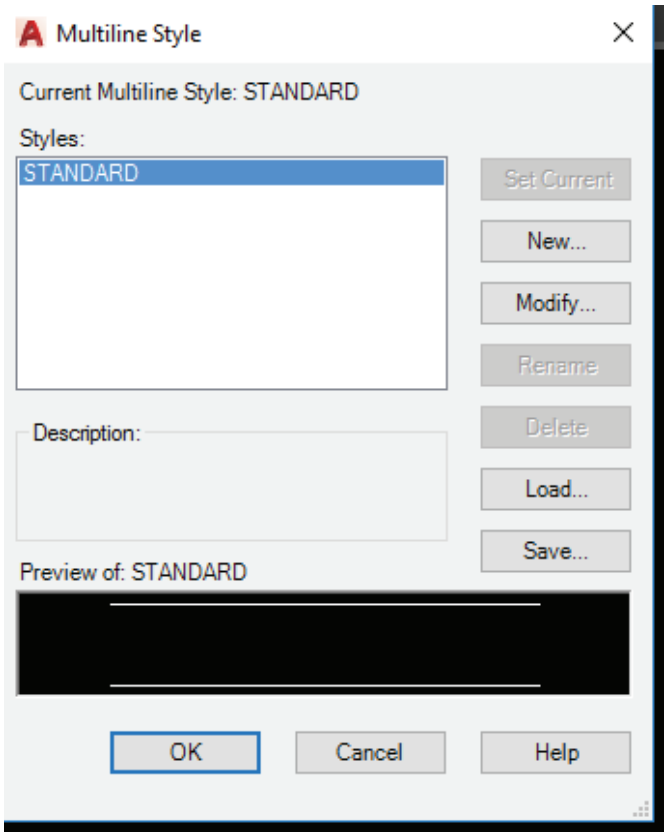


Command: Ray
RAY
Following message will be displayed in command line
RAY Specify start point: Select the point on the graphic window e.g. 6 enter key
Specify through point:
To respond the message, give your options as per requirements

1.4.2.6. Draw Multi line

Multiline are composed of parallel lines, called elements. When you draw a multiline, you can use the STANDARD style, which has two elements

Draw menu bar → multi Line → click on icon
Or
short key
ML→ Enter



Command: ML↵
MLINE
Current settings: Justification = Top, Scale = 1.00, Style = STANDARD
Specify start point or [Justification/Scale/STyle]: 10,10↵
Specify next point: 22,10↵
Specify next point or [Undo]: 22,22↵
Specify next point or [Close/Undo]: 10,22↵
Specify next point or [Close/Undo]: C↵
Specify start point or [Justification/Scale/STyle
To respond the message, give your options as per requirements as under

Justification:	Draw multiline in top, bottom and center
Scale:	Enter scale of multiline distance
Style:	define style of multiline

- **Justification Option**
  The justification determines how a multiline is drawn between the specified points. Three justifications are available for the **MLINE** command. They are **Top, Zero**, and **Bottom** as shown in following figure.

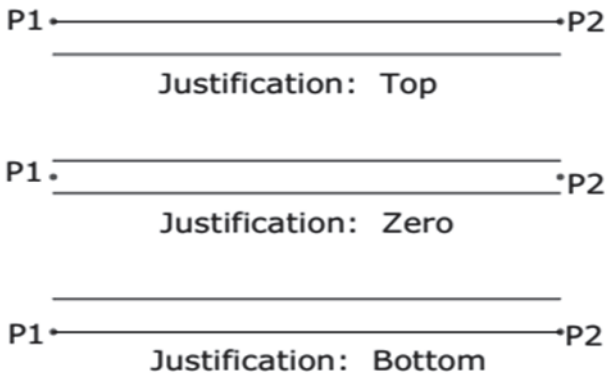


Figure: Justification in multiline

i. **Top**
This justification provides with the points produces a multiline in which the top line coincides with the points you selected on the screen.

ii. **Zero**
This option will produce a multiline in which the zero offset position o the multiline coincides with the selected points.

iii. **Bottom**
This option will produce a multiline in which the bottom line (the line with the least offset distance) coincides with the selected point when the line is drawn from the left to right.

iv. **Scale Option**
The scale option is used to change the scale of a multiline. For example, if the scale factor is 0.5, the distance between the lines (offset distance) will be reduced to half, as shown in following figure. Therefore, the width of the multiline will be half of what was defined of multiline style.

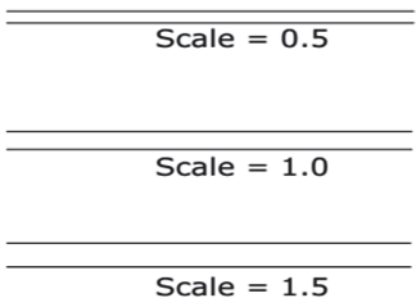
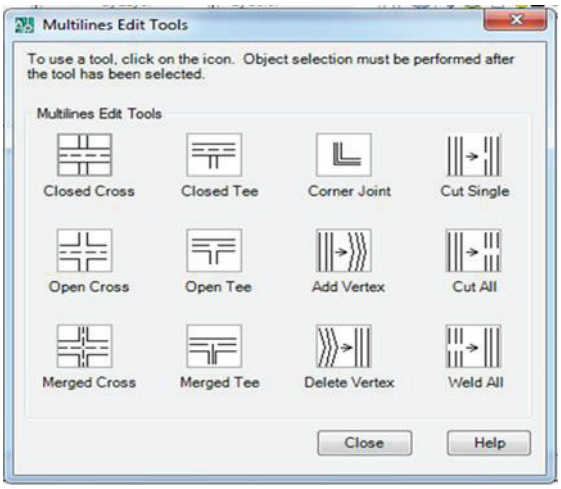


Figure: Different multiline scales

- **MLEDIT**
Menu Bar: Modify > object > **Command:** MLEDIT
When you invoke the MLEDSIT command, Auto CAD displays the Multiline Edit Tools dialog box, see Figure 3. This dialog box contains five basic editing tools. To edit a multiline, first select the editing operation you want to perform by clicking on the image tile.

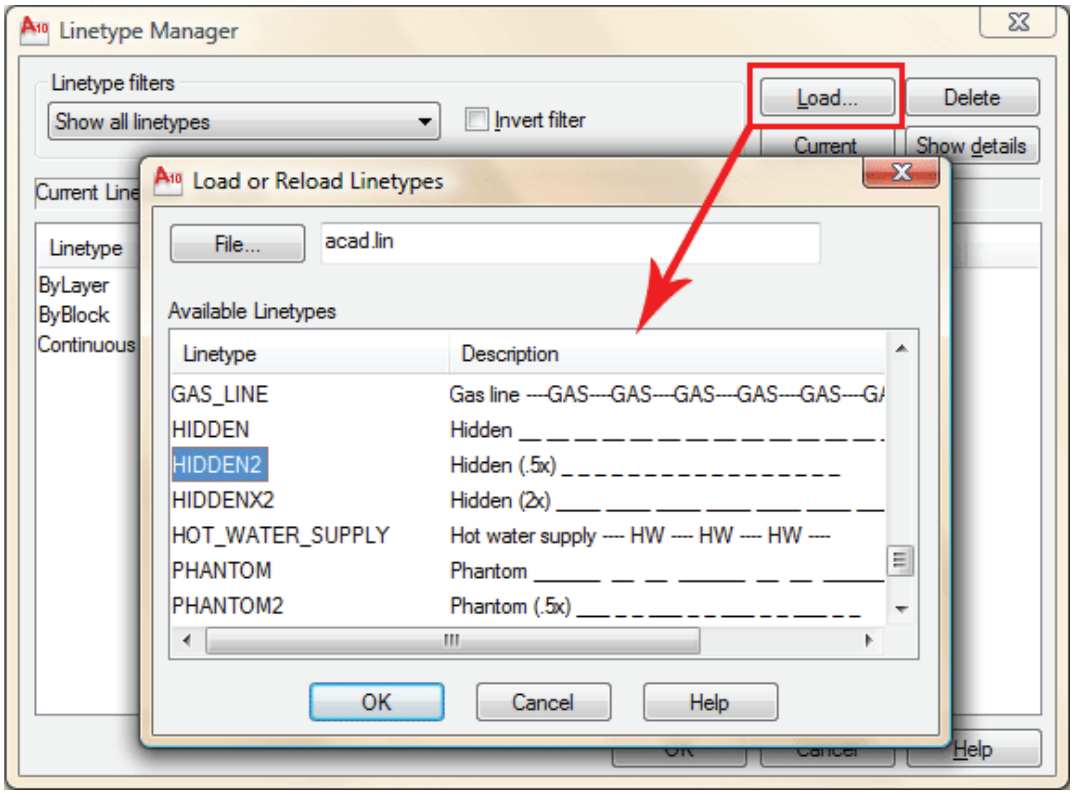
Once you have selected the editing option. AutoCAD will prompt you to select the first and second multilines.

Figure 3: The Multiline Edit Tools dialog box



- **Line Type**

  Line types can be a pattern of dashes, dots, text, and symbols, or unbroken and continuous. The current **line type** setting defines the default appearance of all new geometric objects. You can see which **line type** is current in the Properties panel of the ribbon Home tab when no objects are selected Or can access by entering LT command Type LT enter, then following windows shows by AutoCAD



- **Line type Scale**

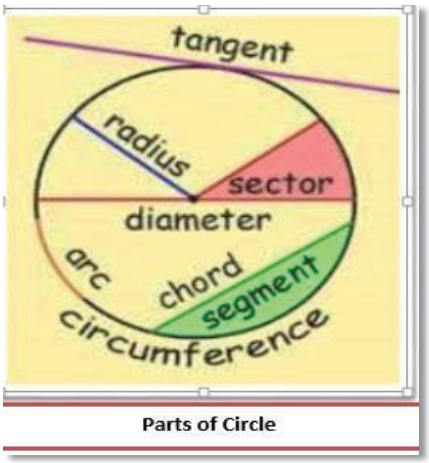
Line type scale controls the size and spacing of repetitions of the linetype pattern for each drawing unit. There are a number of scaling options that can affect in line by follwings steps.

Type **LTS** enter and type scale factor.

HIDDEN - LINETYPE SCALE =1

HIDDEN - LINETYPE SCALE = .5

HIDDEN - LINETYPE SCALE = 5



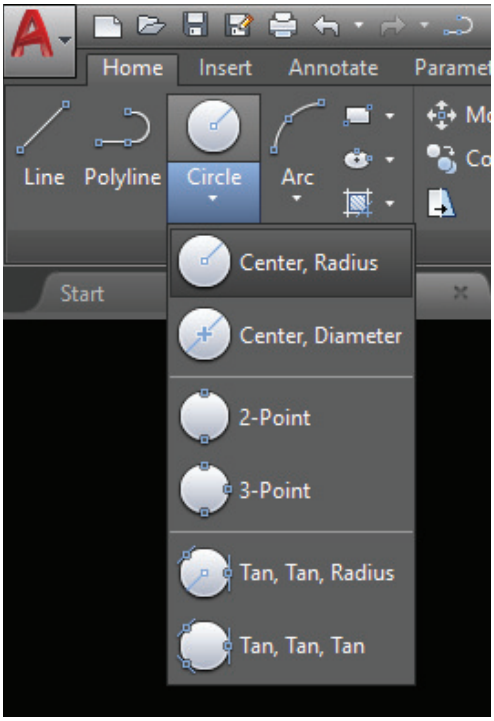
Parts of Circle

- **Circle and Circle Command**
  A circle is a simple closed shape
  The figure formed by the group of points that are an equal distance from a point, or center.
  The angles of a circle add up to 360 degrees.

  i. Circumference: Length of circle is called circumference.
  ii. Radius: A straight line from the center to the circumference of a circle
  iii. Diameter: A straight line passing from side to side through the center of a body or figure, esp. a circle or sphere.
  iv. Chord: Any Straight Line which connects two points of circle is called chord, where as it does not pass from center of circle.
  v. Tangent: Any Straight Line which touches one point of circle is called Tangent.
  vi. Arc: Part of a circle between any two points is called arc.
  vii. Sector: Any area which is constructed by two Radiuses and an Arc is called Sector.
  viii. Segment: Any area which is constructed by chord and an arc is called segment.

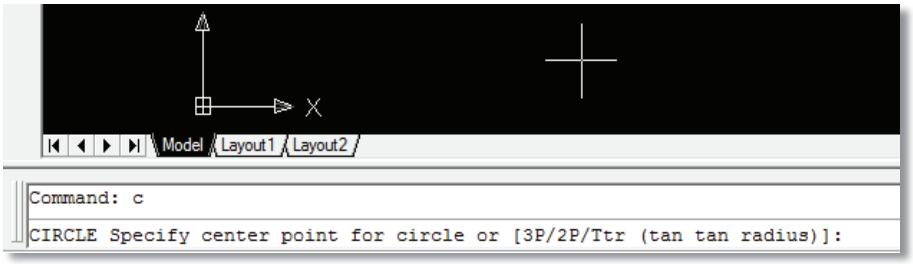
Procedure:

How to create circle

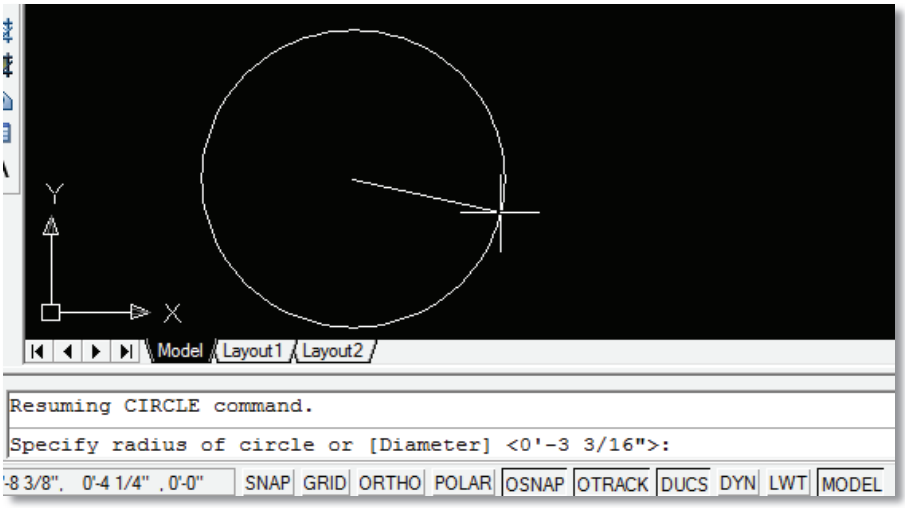


Draw Manu	Draw Toolbar	Command Entry
Circle		Circle/C

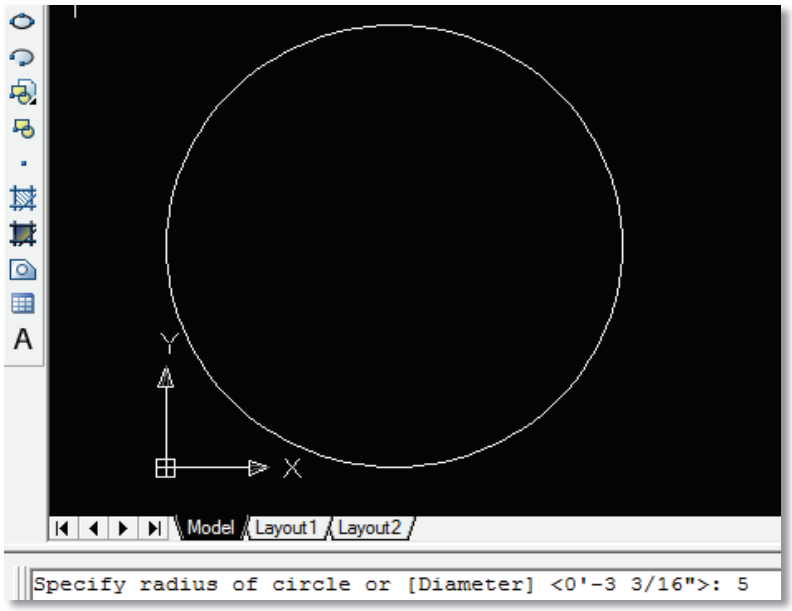
Step-1: Type C
Circle in command Bar and Press Enter



Step-2:
Specify any Point for Centre I.e. 5, 5 and Press Enter



Step-3:
Specify radius of Circle or Diameter: 5 and Press Enter.



- **Tan Tan Radius (TTR)**
  Procedure
  How to create circle with TTR

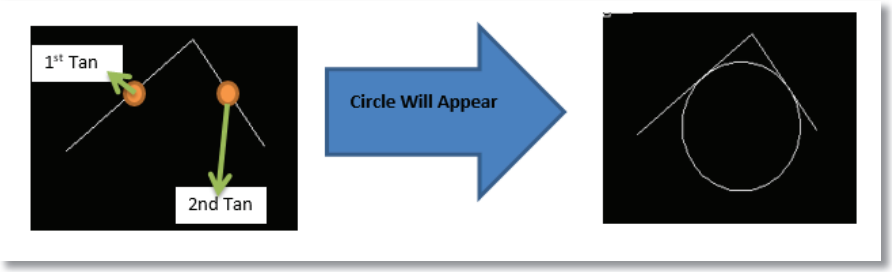
  Step-1: Type C and press ENTER (You See: 3P/2P/TTr)

  Step-2: Type T for (Tan Tan Radius (TTR))

  Step-3: Specify point on object for first tangent of circle: Click on the First Tangent Element (Where the circle will touch)

  Step-4: Specify point on object for second tangent of circle: Click on the Second Tangent Element (Where the circle will touch)

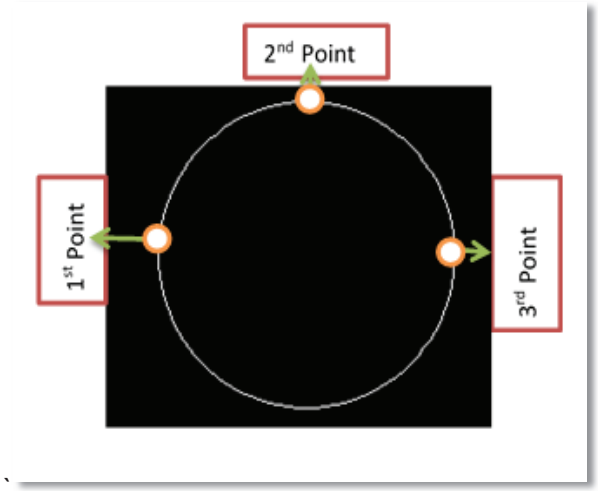
  Step-5: Specify radius of circle <0'-0>: 2



- **3-Points circle:**

  Procedure:
  How **to create circle with 3-P**

  Step-1: Type C Command (see methods above)
  Step-2: 3P/2P/TTR/<Center point>: Type 3p and then press.
  Step-3: Specify first point on circle: Click on First Point.
  Step-4: Specify second point on circle: Click on second Point.
  Step-5: Specify third point on circle: Click on third Point



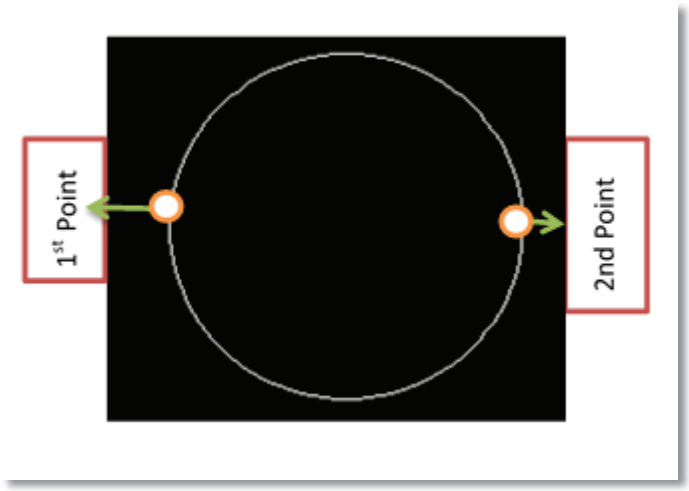
- **2-Points**
  Procedure
  How to create circle with 3-P

  Type C Command (see methods above)

  Step-2: 3P/2P/TTR/<Center point>: Type 2P and then press.

  Step-3: Specify first end point of circle's diameter: Click on First Point

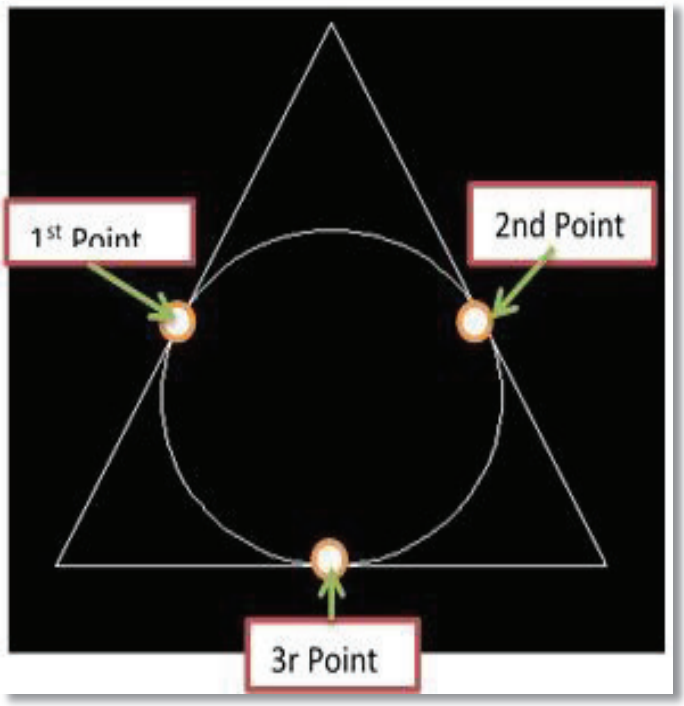
  Step-4: Specify second end point of circle's diameter: Click on second point



- **Tan Tan Tan (TTT)**
  Another sub command of Circle you can activate from the Draw Manu:
  Draw →circle→ TTT

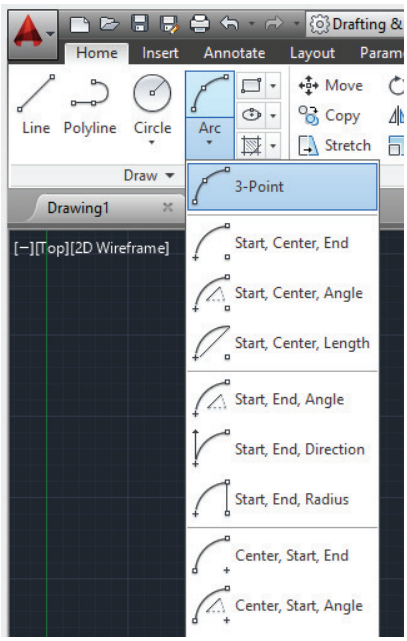
- **Procedure**
  How to create circle with TTT

  Step-1: Click on Draw Manu: Draw→ Circle→ TTT
  Step-2: 3p Specify first point on circle: _tan to. First Point
  Step-3: 3p Specify second point on circle: _tan to. Second Point
  Step-4: 3p Specify third point on circle: _tan to. Third Point



1.4.2.7. Arc Command:

Arc is used to draw an arc between two lines from one point to the next.



Draw Manu	Draw Toolbar	Command Entry
Arc		Arc/A

Procedure

How to draw ARC

- **Command entry: arc**

  Specify start point of arc or [Center]: Specify a point, enter **c**, or press ENTER to start tangent to last line, arc, or polyline

  To create an arc, you can specify combinations of center, endpoint, start point, radius, angle, chord length, and direction values.

i. Start Point

Specifies the starting point of the arc.

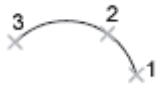
Note: If you press ENTER without specifying a point, the endpoint of the last drawn line or arc is used and you are immediately prompted to specify the endpoint of the new arc. This creates an arc tangent to the last drawn line, arc, or polyline.

Specify second point of arc or [Center /End]:

ii. Second Point

Draws an arc using three specified points on the arc's circumference. The first point is the start point (1). The third point is the endpoint (3). The second point (2) is a point on the circumference of the arc.

Specify end point of arc: *Specify a point (3)*



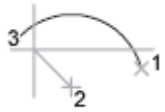
You can specify a three-point arc either clockwise or counter clockwise.

iii. Center

Specifies the center of the circle of which the arc is a part.
Specify center point of arc:
Specify end point of arc or [Angle/chord Length]:

iv. End Point

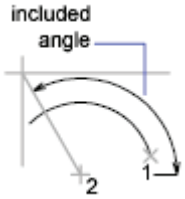
Using the center point (2), draws an arc counter clockwise from the start point (1) to an endpoint that falls on an imaginary ray drawn from the center point through the third point (3).



The arc does not necessarily pass through this third point, as shown in the illustration.

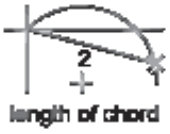
v. Angle
Draws an arc counter clockwise from the start point (1) using a center point (2) with a specified included angle. If the angle is negative, a clockwise arc is drawn.

Specify included angle: *Specify an angle*



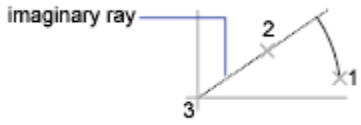
- **Chord Length**

Draws either a minor or a major arc based on the distance of a straight line between the start point and endpoint.
If the chord length is positive, the minor arc is drawn counter clockwise from the start point.
If the chord length is negative, the major arc is drawn counter clockwise.
Specify length of chord: *Specify a length*

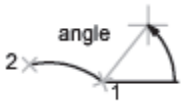


- **End**
  Specifies the endpoint of the arc.
  Specify end point of arc:
  Specify center point of arc or [Angle/Direction/Radius]:

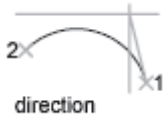
- **Center Point**
  Draws an arc counter clockwise from the start point (1) to an endpoint that falls on an imaginary ray drawn from the center point (3) through the second point specified (2).



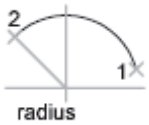
- **Angle**
  Draws an arc counter clockwise from the start point (1) to an endpoint (2), with a specified included angle. If the angle is negative, a clockwise arc is drawn.
  Specify included angle: Enter an angle in degrees or specify an angle by moving the pointing device counter clockwise.



- **Direction**
  Begins the arc tangent to a specified direction. It creates any arc, major or minor, clockwise or counter clockwise, beginning with the start point (1), and ending at an endpoint (2). The direction is determined from the start point.
  Specify tangent direction for the start point of arc:

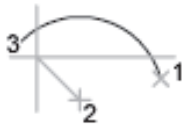


- **Radius**
  Draws the minor arc counter clockwise from the start point (1) to the endpoint (2). If the radius is negative, the major arc is drawn. Specify radius of arc:

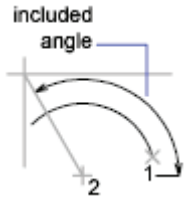


- **Center**
  Specifies the center of the circle of which the arc is a part.
  Specify center point of arc:
  Specify start point of arc:
  Specify end point of arc or [Angle/chord Length]:

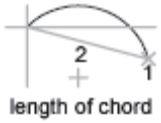
- **End Point**
  Draws an arc counter clockwise from the start point (2) to an endpoint that falls on an imaginary ray drawn from the center point (1) through a specified point (3).



- **Angle**
  Draws an arc counter clockwise from the start point (2) using a center point (1) with a specified included angle. If the angle is negative, a clockwise arc is drawn.
  Specify included angle:



- **Chord Length**
  Draws either a minor or a major arc based on the distance of a straight line between the start point and endpoint.
  If the chord length is positive, the minor arc is drawn counter clockwise from the start point.
  If the chord length is negative, the major arc is drawn counter clockwise.
  Specify length of chord:

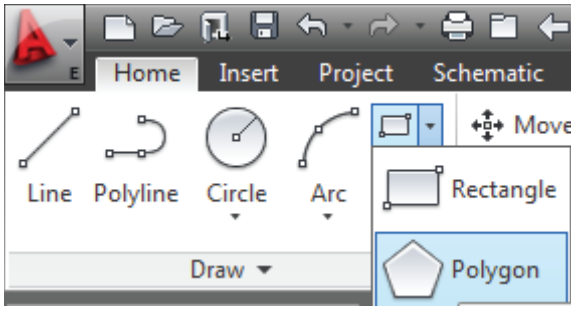


- **Tangent to Last Line, Arc, or Polyline**
  Draws an arc tangent to the last line, arc, or polyline drawn when you press ENTER at the first prompt.

  Specify end point of arc: *Specify a point (1)*

1.4.2.8. Rectangle

Creates a rectangular poly line from the specified the rectangle parameters (length, width, rotation) and type of corners (fillet, chamfer, or square).
There are basic three types of rectangle, area, dimension and rotation.

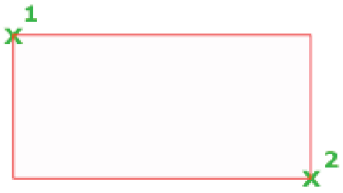


Draw Manu	Draw Toolbar	Command Entry
Rectangle		rec

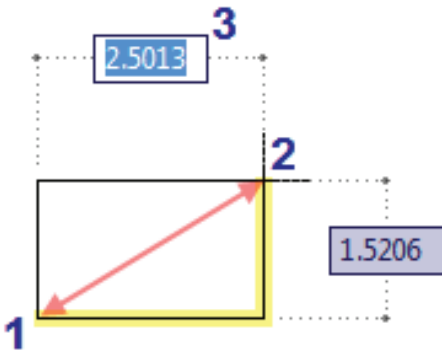
- **Procedure**
  How to draw rectangular

  Click Home tab ➤ Draw panel ➤ Rectangle.  Specify the first corner of the rectangle.
  Specify the other corner of the rectangle.
  OR
  Short key **R Enter**

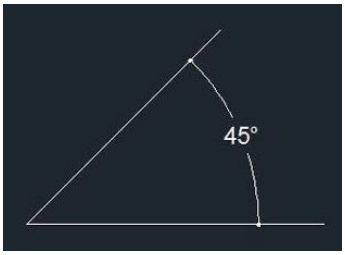
  i. **Area**
  Creates a rectangle using the area and either a length or a width. If the Chamfer or Fillet option is active, the area includes the effect of the chamfers or fillets on the corners of the rectangle.



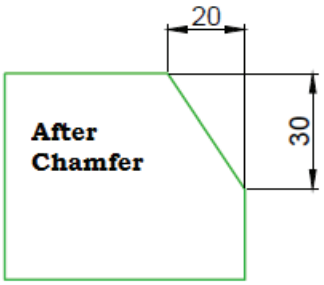
  ii. **Dimensions**
  Creates a rectangle using length and width values.



  iii. **Rotation**
  Creates a rectangle at a specified rotation angle.

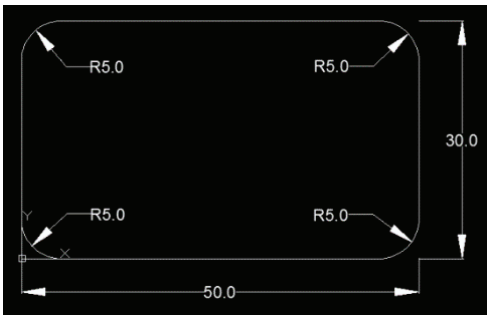


  iv. **Chamfer**
  Sets the chamfer distances for the rectangle.

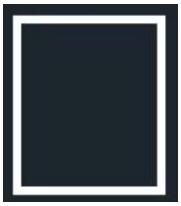


v. Elevation
Specifies the elevation of the rectangle.

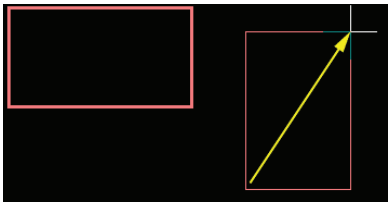
vi. Fillet
Specifies the fillet radius of the rectangle



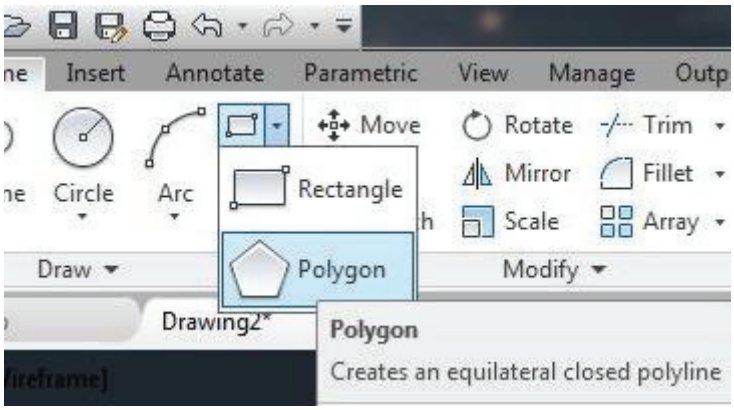
vii. Thickness
Specifies the thickness of the rectangle.



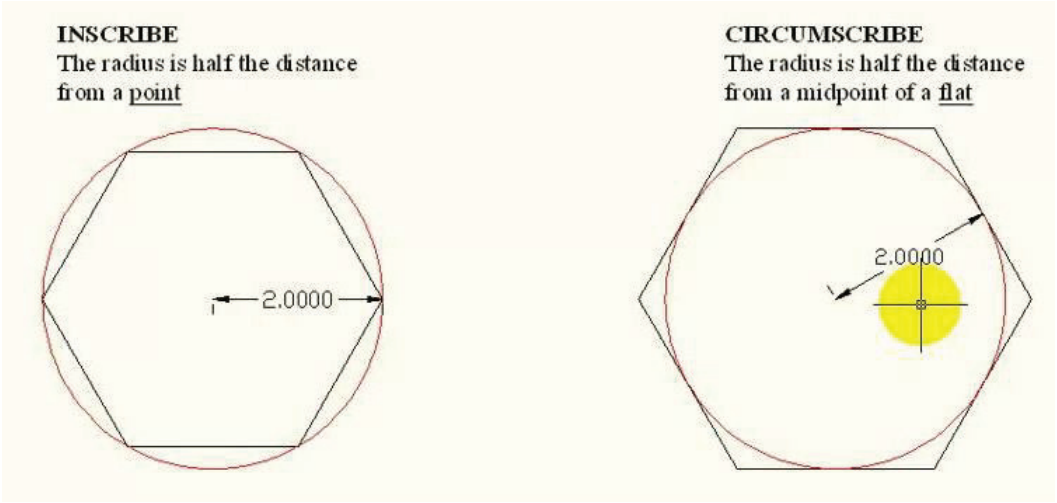
viii. Width
Specifies the polyline width of the rectangle to be drawn.



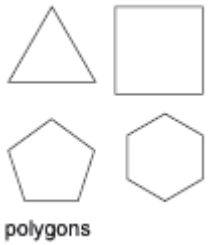
1.4.2.9. Polygon
Polygons can be used to draw equilateral triangles, squares, pentagons, hexagons, and other multi-sided figures.
The following illustrations show polygons created using three methods: inscribed, circumscribed, and edge. In each case, two points are specifies.



Draw Manu	Draw Toolbar	Command Entry
Polygon		POL



Command: polygon
Enter number of sides <current>: Enter a value between 3 and 1024 or press ENTER
Specify center of polygon or [Edge]: Specify a point (1) or enter **e**

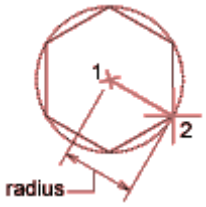


Center of Polygon
Defines the center of the polygon.

Enter an option [Inscribed in circle/Circumscribed about circle] <current>: Enter i or c or press ENTER

Inscribed in Circle

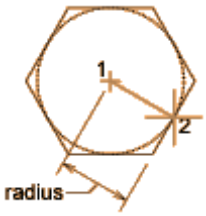
Specifies the radius of a circle on which all vertices of the polygon lie.
Specify radius of circle: Specify a point (2) or enter a value



Specifying the radius with your pointing device determines the rotation and size of the polygon. Specifying the radius with a value draws the bottom edge of the polygon at the current snap rotation angle.

Circumscribed about Circle

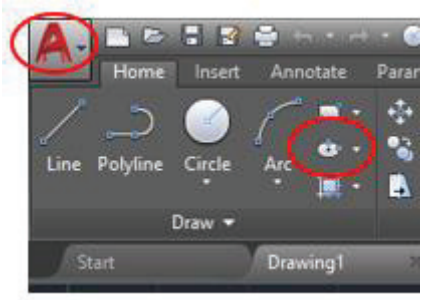
Specifies the distance from the center of the polygon to the midpoints of the edges of the polygon.
Specify radius of circle: Specify a distance



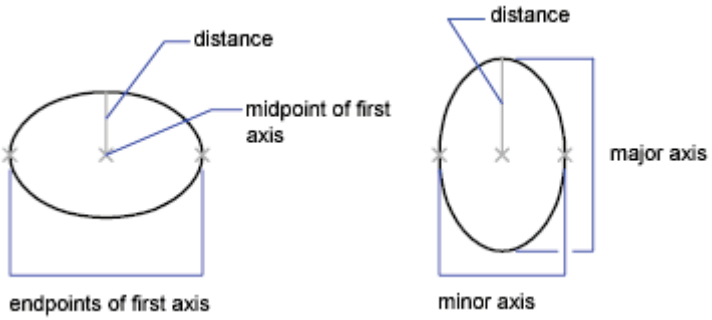
Specifying the radius with your pointing device determines the rotation and size of the polygon. Specifying the radius with a value draws the bottom edge of the polygon at the current snap rotation angle.

1.4.2.10. Ellipse

When you draw an ellipse, its shape is determined by two axes that define its length and width: the major (longer) axis and the minor (shorter) axis.

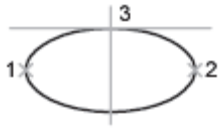


Draw Manu	Draw Toolbar	Command Entry
Ellipse		EL



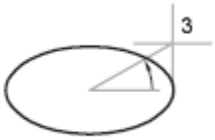
- **Axis Endpoint**
  Defines the first axis by its two endpoints. The angle of the first axis determines the angle of the ellipse. The first axis can define either the major or the minor axis of the ellipse.

- **Distance to Another Axis**
  Defines the second axis using the distance from the midpoint of the first axis to the endpoint of the second axis (3).



ellipse by axis endpoint

- **Rotation**
  Creates the ellipse by appearing to rotate a circle about the first axis.
  Move the crosshairs around the center of the ellipse and click. If you enter a value, the higher the value, the greater the eccentricity of the ellipse. Entering 0 defines a circular ellipse.

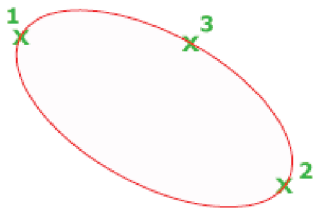


ellipse by rotation

Procedure
Command entry: ellipse

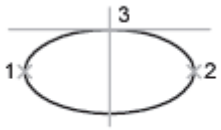
Specify axis endpoint of ellipse or [Arc/Center/Isocircle]: Specify a point or enter an option

The first two points of the ellipse determine the location and length of the first axis. The third point determines the distance between the center of the ellipse and the end point of the second axis.



- **Axis Endpoint**
  Defines the first axis by its two endpoints. The angle of the first axis determines the angle of the ellipse. The first axis can define either the major or the minor axis of the ellipse.
  Specify other endpoint of axis: Specify a point (2)
  Specify distance to other axis or [Rotation]: Specify a distance by entering a value or locating a point (3), or enter **r**

- **Distance to second Axis**
  Defines the second axis using the distance from the midpoint of the first axis to the endpoint of the second axis (3).

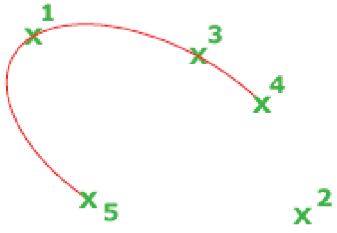


ellipse by axis endpoint

- **Rotation**
  Creates the ellipse by appearing to rotate a circle about the first axis.
  Specify rotation around major axis: Specify a point (3), or enter an positive angle value less than **90**
  Move the crosshairs around the center of the ellipse and click. If you enter a value, the higher the value, the greater the eccentricity of the ellipse. Entering 0 defines a circular ellipse.

ellipse by rotation

- **Arc**
  Creates an elliptical arc.
  The first two points of the elliptical arc determine the location and length of the first axis. The third point determines the distance between the center of the elliptical arc and the endpoint of the second axis. The fourth and fifth points are the start and end angles.

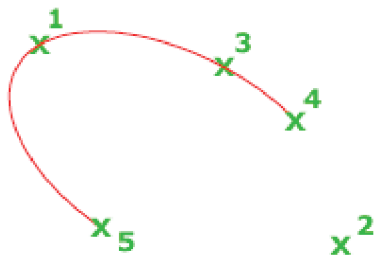


- **Drawing elliptical arcs**

To draw an elliptical arc using start and end angles

i. **Arc**
Creates an elliptical arc.

The first two points of the elliptical arc determine the location and length of the first axis. The third point determines the distance between the center of the elliptical arc and the endpoint of the second axis. The fourth and fifth points are the start and end angles.



The angle of the first axis determines the angle of the elliptical arc. The first axis can define either the major or the minor axis depending on its size.

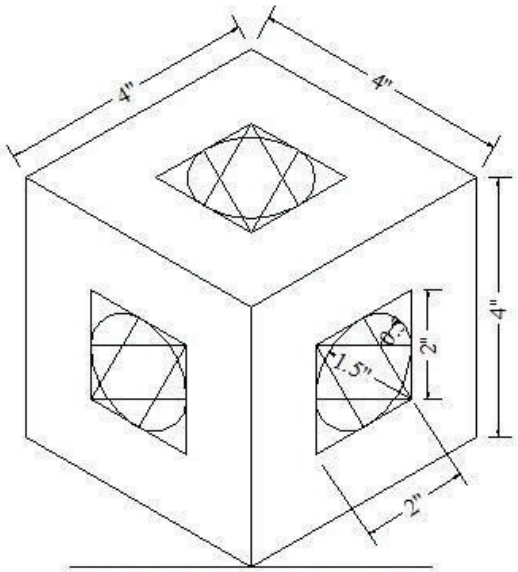
Specify axis endpoint of elliptical arc or [Center]: Specify a point or enter **c**

ii. **Axis Endpoint**
Defines the start point of the first axis.

iii. **Specify other endpoint of axis:**
Specify distance to other axis or [Rotation]: Specify a distance or enter **r**. The descriptions of the Distance to Other Axis and Rotation options match those of the corresponding options under Center.

iv. **Center**
Creates the elliptical arc using a center point you specify.
Specify center of elliptical arc:
Specify endpoint of axis:
Specify distance to other axis or [Rotation]: Specify a distance or enter **r**

- **Drawing isometric circle to draw isometric circles**
  Draw the following as per directions of the teacher



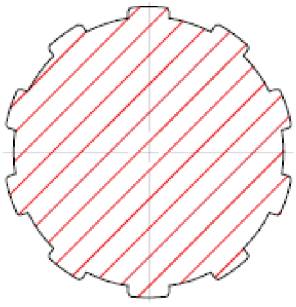
CUBE 4"X4" X4" ISOMETRIC VIEW
HAVING 2" DIA HOLES AT FOCUS

1.4.2.11. Hatch

Fills an enclosed area or selected objects with a hatch pattern, solid fill, or gradient fill. In hatch apply different material as required and justify the scale

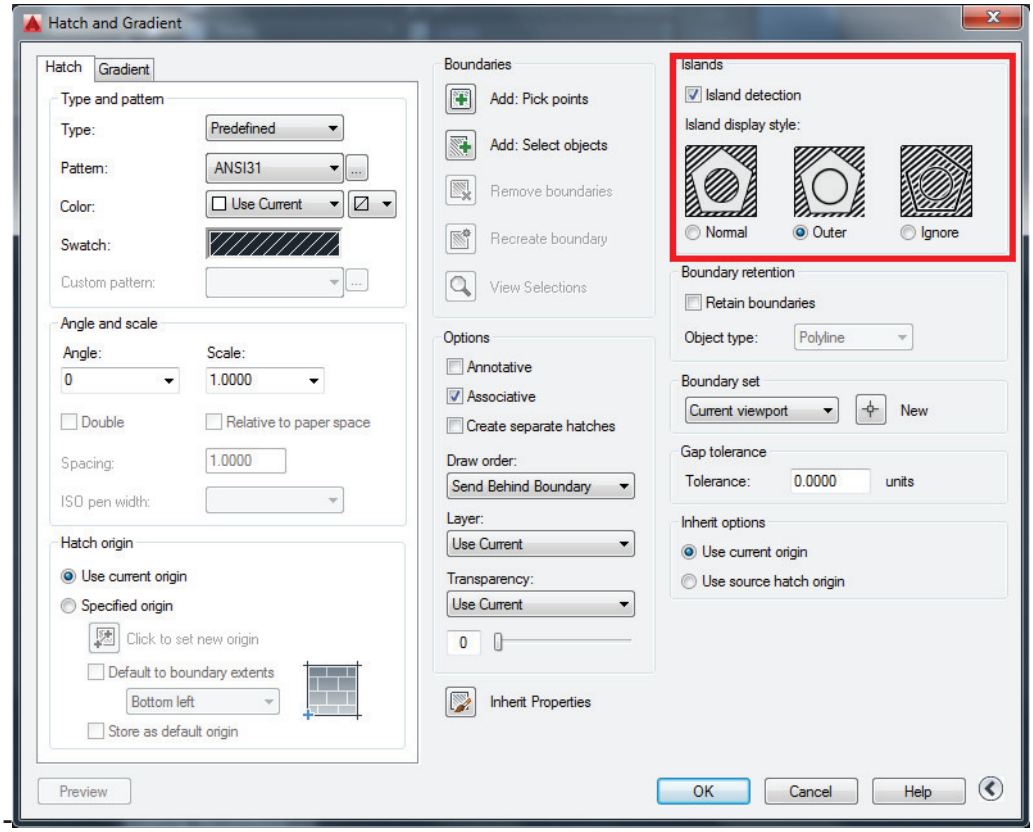
Draw Manu	Draw Toolbar	Command Entry
Hatch		H

Command**: hatch**
The Hatch and Gradient dialog box is displayed. If you enter -hatch at the Command prompt, options are displayed.



Note: By default, the program will not create a hatch pattern that consists of over 10,000 hatch segments. The limit is set by the MaxHatch setting in the registry. To reset the limit to 50,000, for example, enter (setenv "MaxHatch" "50000") at the Command prompt. The limit can be reset to any value between 100 and 10,000,000. You can choose from several methods to specify the boundaries of a hatch.

i. Specify a point in an area that is enclosed by objects.
ii. Select objects that enclose an area.
iii. Drag a hatch pattern into an enclosed area from a tool palette or Design Center.



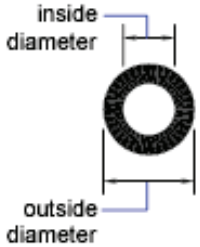
1.4.2.12. Donut

Creates a filled circle or a wide ring or Donut is special type of circle that describes inside outside circle in a same time.

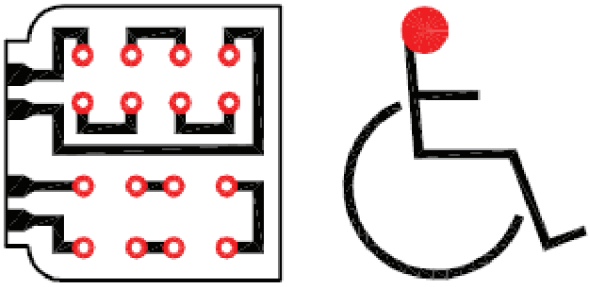
A donut consists of two arc polylines that are joined end-to-end to create a circular shape. The width of the polylines is determined by the specified inside and outside diameters. If you specify an inside diameter of 0, the donut is a filled circle.

Draw Manu	Draw Toolbar	Command Entry
Donut		DO

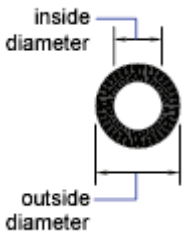
Specifies the inside diameter of the donut as shown.



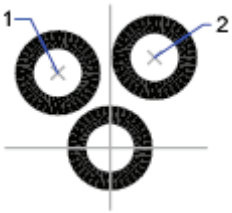
Command: **donut**
A donut consists of two arc polylines that are joined end-to-end to create a circular shape. The width of the polylines is determined by the specified inside and outside diameters. To create solid-filled circles, specify an inside diameter of zero.



Specify inside diameter of donut <current>: Specify a distance or press ENTER
If you specify an inside diameter of 0, the donut is a filled circle.
Specify outside diameter of donut <current>: Specify a distance or press ENTER
Specify center of donut or <exit>: Specify a point (1) or press ENTER to end the command.



The location of the donut is set based on the center point. After you specify the diameters, you are prompted for the locations at which to draw donuts. A donut is drawn at each point specified (2). How the interior of a donut is filled depends on the current setting of the FILL command.



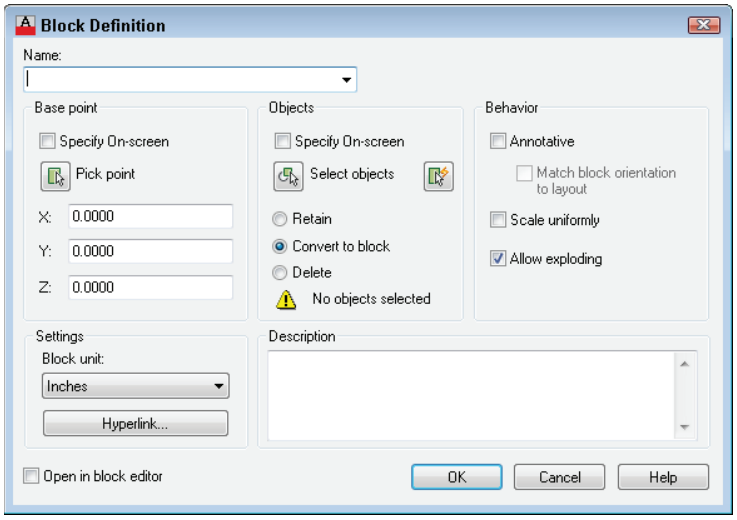
1.4.2.13. Block

A block is simply a collection of objects (it could be one object) that has a name. Blocks have several advantages:

i. You can insert them again and again, saving time. In fact, you can insert them into other drawings as well.

ii. A block uses less electronic space than individual objects, so your drawing file is smaller.
iii. By updating a block's definition, you can update all the blocks in the drawing.

- **How do you create a block?**
  To create a block, follow these steps:



i. Draw the objects that you want in the block.
ii. Choose Home tab> Block panel> Create to start the BLOCK command. The Block Definition dialog box opens.
iii. Type a name in the Name text box. The name can have spaces.
iv. You need to specify a base point. That's the point at which you'll insert the block. In the Base Point section, click Pick Point. Be sure to use an object snap for accuracy! You'll immediately be returned to the dialog box.
v. In the Objects section, click the Select Objects button. Select the objects and press Enter to return to the dialog box. **Tip:** You can select the objects before using the command and they'll show up in the dialog box.
vi. Just below, choose Retain, Convert to Block, or Delete. These options control what happens after you create the block.
vii. In the Behavior section, you can make a block Annotative (more info here), force it to scale uniformly and choose whether to allow exploding.
viii. In the Settings area, choose the block unit. You can choose Unitless but if you choose a unit, AutoCAD will try to scale the block appropriately when you insert it into another drawing. You can also add a hyperlink if you want.
ix. Finally, you can add a description in the Description box. A description is helpful in the Design Center, when you want to insert the block from another drawing.
x. Click OK to complete the box. If you chose Delete, the objects disappear. You can use the OOPS command to bring them back.

1.4.2.14. Point

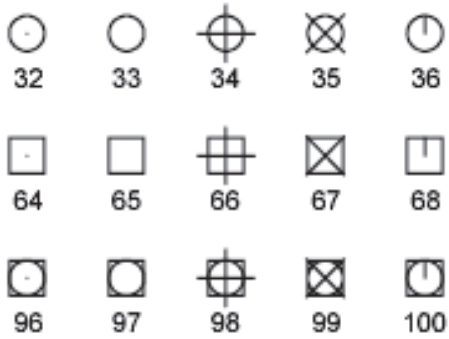
To set point style and size
POINT Creates a point object.

Draw Manu	Draw Toolbar	Command Entry
Point		point

Command entry: point

- **Specify a point:**
  Points can act as nodes to which you can snap objects. You can specify a full three-dimensional location for a point. The current elevation is assumed if you omit the *Z* coordinate value.
  The PDMODE and PDSIZE system variables control the appearance of point objects. PDMODE values 0, 2, 3, and 4 specify a figure to draw through the point. A value of 1 specifies that nothing is displayed.

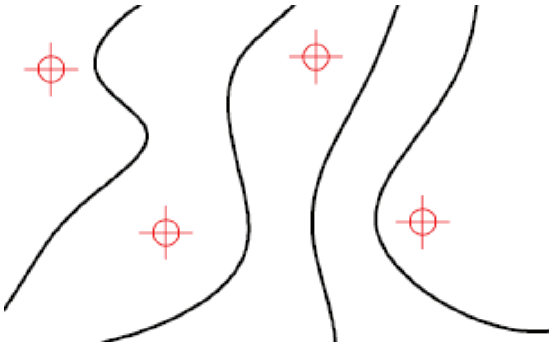
Specifying the value 32, 64, or 96 selects a shape to draw around the point, in addition to the figure drawn through it:



PDSIZE controls the size of the point figures, except for PDMODE values 0 and 1. A setting of 0 generates the point at 5 percent of the drawing area height. A positive PDSIZE value specifies an absolute size for the point figures. A negative value is interpreted as a percentage of the viewport size.

After you change PDMODE and PDSIZE, the appearance of existing points changes the next time the drawing is regenerated.

You can use MEASURE and DIVIDE to create points along an object. Use DDPTYPE to specify point size and styles easily.



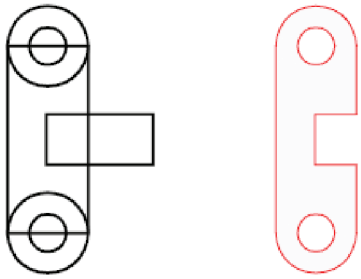
1.4.2.15. Regions

i. To create a region by selecting objects
ii. To create regions using boundaries
iii. To create a composite region by subtraction
iv. Create composite solids or regions from the intersection of two or more solids or regions and remove the areas outside of the intersection

REGION Converts an object that encloses an area into a region object.

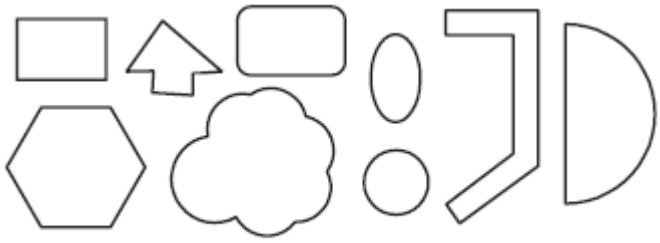
Draw Manu	Draw Toolbar	Command Entry
Region		**REG**

Select objects: Use an object selection method and press ENTER when you finish
Regions are two-dimensional areas you create from closed shapes or loops. Closed polylines, lines, and curves are valid selections. Curves include circular arcs, circles, elliptical arcs, ellipses, and splines.
You can combine several regions into a single, complex region.



Regions can be used for

- Extracting design information
- Applying hatching and shading
- Combining simple objects into more complex ones with Boolean operations.



shapes that can form regions

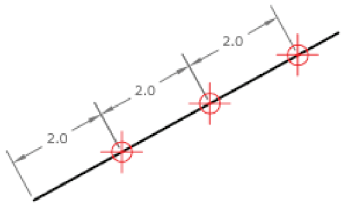
Command: **REG**
Select objects: Select Object and press enter
Select objects: 1 found
1 loop extracted.
1 Region created.

1.4.2.16. MEASURE

Draw Manu	Draw Toolbar	Command Entry
Point		**ME**

Creates point objects or blocks at measured intervals along the length or perimeter of an object.

Command entry: measure
Select object to measure:
Specify length of segment or [Block]: *Specify a distance or enter* **b**
The resulting points or blocks are always located on the selected object and their orientation is parallel to the *XY* plane of the UCS.
Use DDPTYPE to set the style and size of all point objects in a drawing.



1.4.2.17. DIVIDE

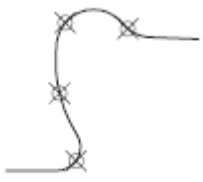
Draw Manu	Draw Toolbar	Command Entry
Point		**DIV**

Creates evenly spaced point objects or blocks along the length or perimeter of an object.

Access Methods
Command entry: **divide**
Select object to divide: Use an object selection method
Enter number of segments or [Block]: Enter a value from 2 through 32,767, or enter b

Number of Segments
Places point objects at equal intervals along the selected objects.


select polyline


divided into five parts

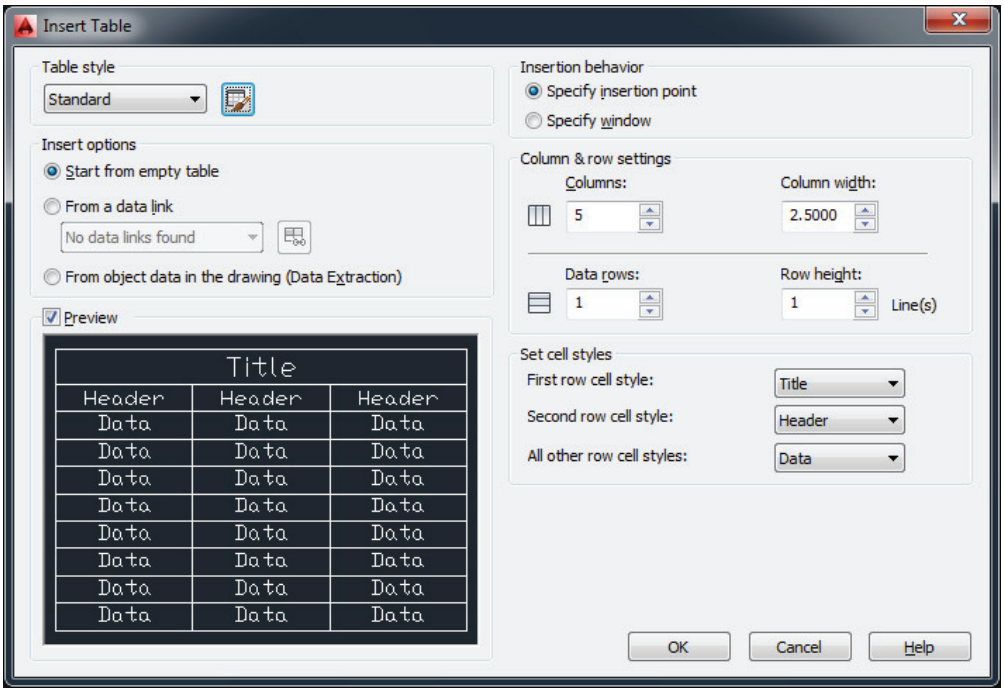
1.4.2.18. Table

Creates an empty table object.

Draw Manu	Draw Toolbar	Command Entry
Table		**Table**

A table is a compound object that contains data in rows and columns. It can be created from an empty table or a table style. A table can also be linked to data in a Microsoft Excel spreadsheet.

Command: Table
The following window will show in AutoCAD



- **Table Style**
  Choose a table style from within the current drawing from which to create a table. You can create a new table style by clicking the button next to the drop-down list.

- **Insert Options**
  Specifies the method for inserting your table.

  i. **Start from Empty Table**
  Creates an empty table that can be filled in with data manually.

  ii. **Start from Data Link**
  Creates a table from data in an external spreadsheet.

  iii. **Start from Data Extraction (not available in AutoCAD LT)**
  Launches the Data Extraction wizard.

- **Preview**
  Controls whether a preview display. If you start from an empty table, the preview displays an example of the table style. If you create a table link, the preview displays the resulting table. Clear this option to improve performance when working with large tables.

- **Insertion Behavior**
  Specifies the location of the table.

  i. **Specify Insertion Point**
  Specifies the location of the upper-left corner of the table. You can use the pointing device or enter coordinate values at the Command prompt. If the table style sets the direction of the table to read from the bottom up, the insertion point is the lower-left corner of the table.

  ii. **Specify Window**
  Specifies a size and a location for the table. You can use the pointing device or enter coordinate values at the Command prompt. When this option is selected, the number of columns and rows and the column width and row height depend on the size of the window and the column and row settings.

- **Column & Row Settings**
  Set the number and size of columns and rows

  i. **Columns Icon**
  Indicates columns.

  ii. **Rows Icon**
  Indicates rows.

  iii. **Columns**
  Specifies the number of columns. When the Specify Window option is selected and you specify a column width, the Auto option is selected, and the number of columns is controlled by the width of the table. If a table style containing a starting table has been specified, then you can choose the number of additional columns you would like added to that starting table.

  iv. **Column Width**
  Specifies the width of the columns. When the Specify Window option is selected and you specify the number of columns, the Auto option is selected, and the column width is controlled by the width of the table. The minimum column width is one character.

  v. **Data Rows**
  Specifies the number of rows. When the Specify Window option is selected and you specify a row height, the Auto option is selected, and the number of rows is controlled by the height of the table. A table style with a title row and a header row has a minimum of three rows. The minimum row height is one line. If a table style containing a starting table has been specified, then you can choose the number of additional data rows you would like added to that starting table.

vi. **Row Height**
Specifies the height of the rows in number of lines. The height of a line is based on the text height and the cell margin, which are both set in the table style. When the Specify Window, option is selected and you specify the number of rows, the Auto option is selected, and the row height is controlled by the height of the table.

- **Set Cell Styles**
For table styles that do not contain a starting table, specifies a cell style for rows in the new table.

i. **First Row Cell Style**
Specifies a cell style for the first row in the table. The Title cell style is used by default.

ii. **Second Row Cell Style**
Specifies a cell style for the second row in the table. The Header cell style is used by default.

iii. **All Other Row Cell Styles**
Specifies a cell style for all other rows in the table. The Data cell style is used by default.

1.4.2.19. Text

Creates a single-line text object. You can use single-line text to create one or more lines of text

Draw Manu	Draw Toolbar	Command Entry
Text		**Text**

Command entry: **text**
Current text style: <current> Current text height: <current> Annotative: <current>
Specify start point of text or [Justify/Style]: Specify a point or enter an option

You can use single-line text to create one or more lines of text, where each text line is an independent object that you can relocate, reformat, or otherwise modify.

The TEXT command creates a single-line text object. It displays a simplified version of the In-Place Text Editor that consists of a bounding box that is the height of the text and expands as you type. Right-click to select options on the shortcut menu.

If TEXT was the last command entered, pressing ENTER at the Specify Start Point of Text prompt skips the prompts for paper height and rotation angle. The text that you enter in the In-Place Text Editor for single-line text is placed directly beneath the previous line of text. The point that you specified at the prompt is also stored as the insertion point of the text.

If the DTEXTED system variable is set to 1, text created using TEXT or DTEXT displays the Edit Text dialog box.

If DTEXTED is set to 2, the In-Place Text Editor is displayed. When creating text, you can click anywhere in a drawing to create a new text block. You can also use the keyboard to move among text blocks (for example: for new text created using the TEXT command, you can navigate through text groups by pressing TAB or Shift + TAB, or edit a group of text lines by pressing ALT and clicking each text object.)

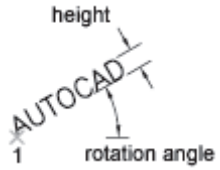
Note: Text that would otherwise be difficult to read (if it is very small, very large, or is rotated) is displayed at a legible size and is oriented horizontally so that you can easily read and edit it.

You can enter special characters and format text by entering Unicode strings and control codes.

Use -TEXT to honor the TEXTEVAL system variable.

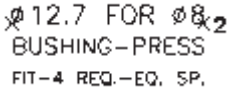
DTEXT is the same as TEXT.

- **Start Point**
  Specifies a start point for the text object.
  Specify height <current>: Specify a point (1), enter a value, or press ENTER
  The Specify Height prompt is displayed only if the current text style is not annotative and does not have a fixed height.
  Specify paper text height <current>: Specify a height, or press ENTER
  The Specify Paper Text Height prompt is displayed only if the current text style is annotative.
  Specify rotation angle of text <current>: Specify an angle or press ENTER
  Enter text in the In-Place Text Editor for single-line text.



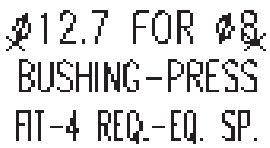
- **Justify**
  Controls justification of the text.
  Enter an option [Align/Fit/Center/Middle/Right/TL/TC/TR/ML /MC/MR/BL/BC/BR]:
  You can also enter any of these options at the Specify Start Point of Text prompt.

- **Align**
  Specifies both text height and text orientation by designating the endpoints of the baseline.
  Specify first endpoint of text baseline: Specify a point (1)
  Specify second endpoint of text baseline: Specify a point (2)
  Enter text in the In-Place Text Editor for single-line text.
  The size of the characters adjusts in proportion to their height. The longer the text string, the shorter the characters.



- **Fit**
  Specifies that text fits within an area and at an orientation defined with two points and a height. Available for horizontally oriented text only.

Specify first endpoint of text baseline: Specify a point (1)
Specify second endpoint of text baseline: Specify a point (2)
Specify height <current>:
Enter text in the In-Place Text Editor for single-line text.

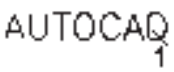


The height is the distance in drawing units that the uppercase letters extend from the baseline. Designated text height is the distance between the start point and a point you specify. The longer the text string, the narrower the characters. The height of the characters remains constant.

- **Center**
  Aligns text from the horizontal center of the baseline, which you specify with a point.
  Specify center point of text: Specify a point (1)
  Specify height <current>:
  Specify rotation angle of text <current>:
  Enter text in the In-Place Text Editor for single-line text.
  The rotation angle specifies the orientation of the text baseline with respect to the center point. You can designate the angle by specifying a point. The text baseline runs from the start point toward the specified point. If you specify a point to the left of the center point, the text is drawn upside down.

- **Middle**
  Aligns text at the horizontal center of the baseline and the vertical center of the height you specify. Middle-aligned text does not rest on the baseline.
  Specify middle point of text: Specify a point (1)
  Specify height <current>:
  Specify rotation angle of text <current>:
  Enter text in the In-Place Text Editor for single-line text.
  The Middle option differs from the MC option in that it uses the midpoint of all text, including descenders. The MC option uses the midpoint of the height of uppercase letters.

- **Right**
  Right-justifies the text at the baseline, which you specify with a point.
  Specify right endpoint of text baseline: Specify a point (1)
  Specify height <current>:
  Specify rotation angle of text <current>:
  Enter text in the In-Place Text Editor for single-line text.



- **TL (Top Left)**
  Left-justifies text at a point specified for the top of the text. Available for horizontally oriented text only.
  Specify top-left point of text: Specify a point (1)
  Specify height <current>:
  Specify rotation angle of text <current>:
  Enter text in the In-Place Text Editor for single-line text.

- **TC (Top Center)**
  Centers text at a point specified for the top of the text. Available for horizontally oriented text only.
  Specify top-center point of text: Specify a point (1)
  Specify height <current>:
  Specify rotation angle of text <current>:
  Enter text in the In-Place Text Editor for single-line text.

- **TR (Top Right)**
  Right-justifies text at a point specified for the top of the text. Available for horizontally oriented text only.
  Specify top-right point of text: Specify a point (1)
  Specify height <current>:
  Specify rotation angle of text <current>:
  Enter text in the In-Place Text Editor for single-line text.

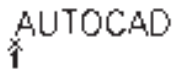
- **ML (Middle Left)**
  Left-justifies text at a point specified for the middle of the text. Available for horizontally oriented text only.
  Specify middle-left point of text: Specify a point (1)
  Specify height <current>:
  Specify rotation angle of text <current>:
  Enter text in the In-Place Text Editor for single-line text.

- **MC (Middle Center)**
  Centers the text both horizontally and vertically at the middle of the text. Available for horizontally oriented text only.
  Specify middle-center point of text: Specify a point (1)
  Specify height of text <current>:
  Specify rotation angle of text <current>:
  Enter text in the In-Place Text Editor for single-line text.

The MC option differs from the Middle option in that it uses the midpoint of the height of uppercase letters. The Middle option uses the midpoint of all text, including descenders.

- **MR (Middle Right)**
  Right-justifies text at a point specified for the middle of the text. Available for horizontally oriented text only.
  Specify middle-right point of text: Specify a point (1)
  Specify height <current>:
  Specify rotation angle of text <current>:
  Enter text in the In-Place Text Editor for single-line text.

- **BL (Bottom Left)**
  Left-justifies text at a point specified for the baseline. Available for horizontally oriented text only.
  Specify bottom-left point of text: Specify a point (1)
  Specify height <current>:
  Specify rotation angle of text <current>:
  Enter text in the In-Place Text Editor for single-line text.



- **BC (Bottom Center)**
  Centers text at a point specified for the baseline. Available for horizontally oriented text only.
  Specify bottom-center point of text: Specify a point (1)
  Specify height <current>:
  Specify rotation angle of text <current>:
  Enter text in the In-Place Text Editor for single-line text.

- **BR (Bottom Right)**
  Right-justifies text at a point specified for the baseline. Available for horizontally oriented text only.
  Specify bottom-right point of text: Specify a point (1)
  Specify height <current>:
  Specify rotation angle of text <current>:
  Enter text in the In-Place Text Editor for single-line text.
- **Style**
  Specifies the text style, which determines the appearance of the text characters. Text you create uses the current text style.
  Enter style name or [?] <current>: Enter a text style name or enter **?** to list all text styles
  Entering **?** lists the current text styles, associated font files, height, and other parameters.

AUTOCAD
AUTOCAD
AUTOCAD
various styles

1.4.2.20. MULTI TEXT

Creates a multiline text object.

Draw Manu	Draw Toolbar	Command Entry
Text		**MULTITEXT**

Command entry: **mtext**
Current text style: <current> Text height: <current> Annotative: <current>
Specify first corner:
Specify opposite corner or [Height/Justify/Linespacing/Rotation/Style/Width/Columns]:
You can create several paragraphs of text as a single multiline text (mtext) object. With the built-in editor, you can format the text appearance, columns, and boundaries.
After you specify the point for the opposite corner when the ribbon is active, the MTEXT ribbon contextual tab displays. If the ribbon is not active, the in-place text editor is displayed.
If you specify one of the other options, or if you enter **-mtext** at the Command prompt, MTEXT bypasses the In-Place Text editor and displays additional command prompts.

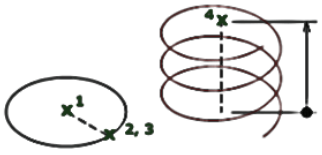
1.4.2.21. Helixes

A helix is an open 2D or 3D spiral.

Draw Manu	Draw Toolbar	Command Entry
Helixes	N/A	**Helixes**

You can use a helix as a path along which to sweep an object to create an image. For example, you might sweep a circle along a helix path to create a solid model of a spring.
When you create a helix, you can specify the following:

- Base radius
- Top radius
- Height
- Number of turns
- Turn height
- Twist direction



If you specify the same value for both the base radius and the top radius, then a cylindrical helix is created. By default, the top radius is set to the same value as the base radius. You cannot specify 0 for both the base radius and top radius.
If you specify different values for the top radius and the base radius, then a conical helix is created.
If you specify a height value of 0, then a flat, 2D spiral is created.

i. Click Home tab →Draw panel →Helix.
ii. Specify the center point for the base of the helix.
iii. Specify the base radius.
iv. Specify the top radius or press Enter to specify the same value as the base radius.
v. Specify the height of the helix.

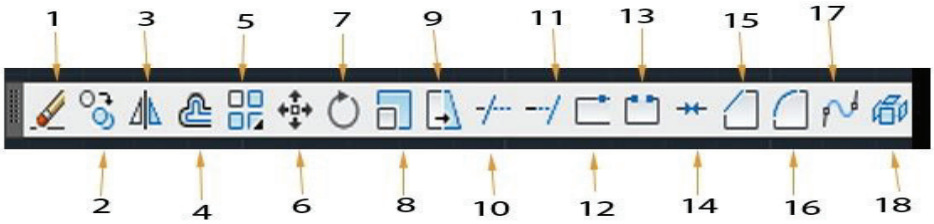
1.4.2.22. GRADIENT

Fills an enclosed area or selected objects with a gradient fill.

Draw Manu	Draw Toolbar	Command Entry
GRADIENT		GRADIENT

1.4.3. Modify Toolbar

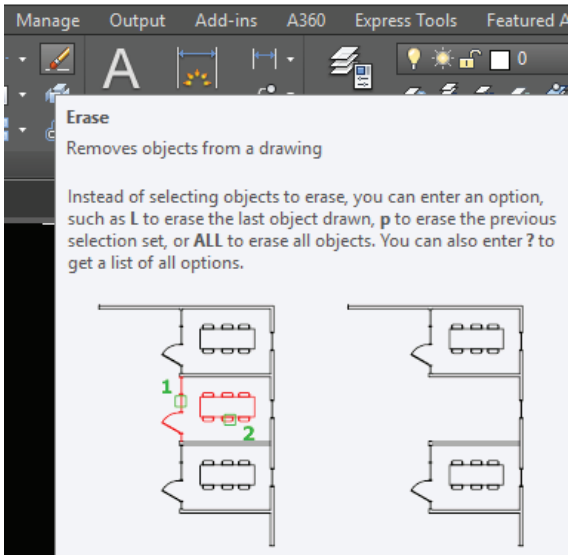
This Modification in 2D drawing and let the leaner to know the manipulation of an object as desire. After completion of this toolbar you will be able to manipulate erase, delete, and Zoom objects.



1	Erase	10	Trim
2	Copy	11	Extend
3	Mirror	12	Break at point
4	Offset	13	Break
5	Array	14	Join
6	Move	15	Chamfer
7	Rotate	16	Fillet
8	Scale	17	Blend curves
9	Stretch	18	Explode

1.4.3.1. Erase Command

ERASE Command: Erase command is used to removes objects from a drawing.



Modify Manu	Modify Toolbar	Command Entry
Erase		Erase/E

- **Procedure**

  How to Erase an Object

  Step-1: Type Erase/E in command bar and Press Enter
  Step-2: Select Object and Press Enter
  The Selected Object should be Erase/Delete.

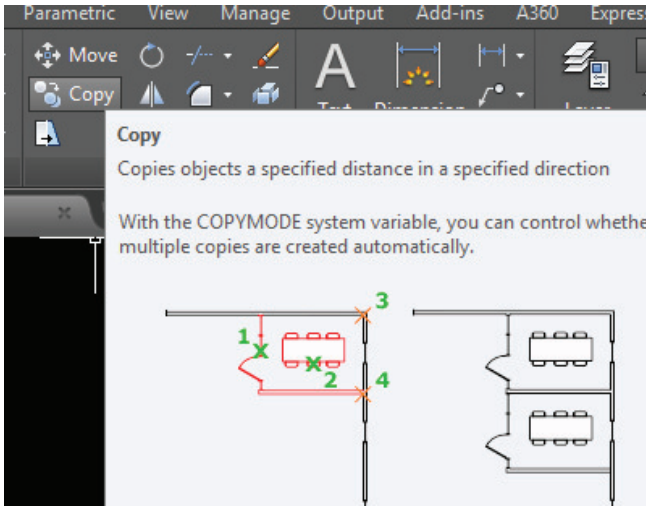
Do You Know!

Alternate Method

Select the object/s and Press **Delete** button

1.4.3.2. Copy command

Copies objects a specified distance in a specified direction or duplication of objects.



Modify Manu	Modify Toolbar	Command Entry
Copy		C or CP

The following prompts are displayed

i. Select objects: Use an object selection method and press Enter when you finish
ii. Specify base point or [Displacement/mode/Multiple] <Displacement>: Specify a base point or enter an option
iii. Specify second point or [Array] <use first point as displacement>: Specify a second point or enter an option

- **Displacement**

  Specifies a relative distance and direction using coordinates or distance

  Mode
  Controls whether the command repeats automatically (COPYMODE system variable).

  i. **Single**
  Creates a single copy of selected objects and ends the command.

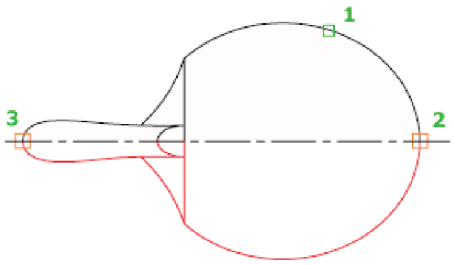
ii. Multiple
Overrides the Single mode setting. The COPY command is set to repeat automatically for the duration of the command.

1.4.3.3. Mirror command

Creates a mirrored copy of selected objects

Modify Manu	Modify Toolbar	Command Entry
Mirror		Mi

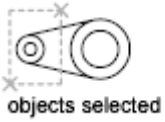
You can create objects that represent half of a drawing, select them, and mirror them across a specified line to create the other half.

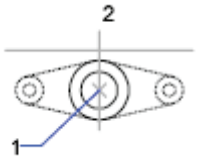


- **Creates a mirrored copy of selected objects**.
  Modify menu bar → Mirror → select image → specify the first point of mirror line → specify the second point of mirror line
  Or
  short Key
  Mi → Enter

  Command entry: mirror

i. Select objects:
Use an object selection method and press Enter to finish
Specify first point of mirror line: Specify a point
Specify second point of mirror line: Specify a point



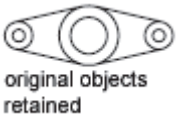


The two specified points become the endpoints of a line about which the selected objects are mirrored. For mirroring in 3D, this line defines a mirroring plane perpendicular to the *XY* plane of the user coordinate system (UCS) containing the mirror line.

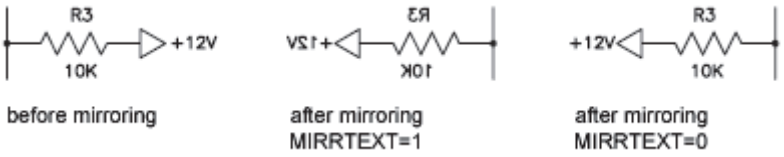
Erase source objects? [Yes/No] <N>: *Enter* **y** *or* **n**, *or press* Enter

ii. Yes
Places the mirrored image into the drawing and erases the original objects.

iii. No
Places the mirrored image into the drawing and retains the original objects.



Note: By default, when you mirror a text object, the direction of the text is not changed. Set the MIRRTEXT system variable to 1 if you do want the text to be reversed.



From the library insert the followings and practice for copy, mirror commands. Create symbols of the followings.

1.4.3.4. Offset command

Creates a mirrored copy of selected objects

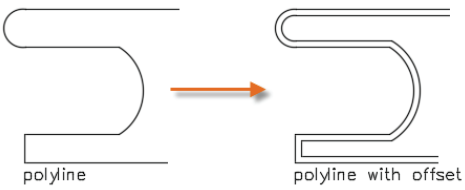
Modify Manu	Modify Toolbar	Command Entry
Offset		O

You can offset an object at a specified distance or through a point. After you offset objects, you can trim and extend them as an efficient method to create drawings containing many parallel lines and curves.

Command: **OFFSET enter**
Specify offset diatance: 10 enter
Secify object to offset: click / select by window
Specify the point on side to offset: click

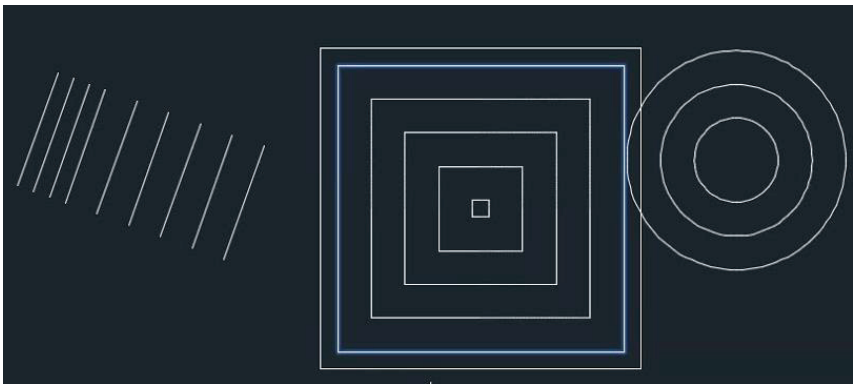
i. Offset Distance

Creates an object at a specified distance from an existing object.



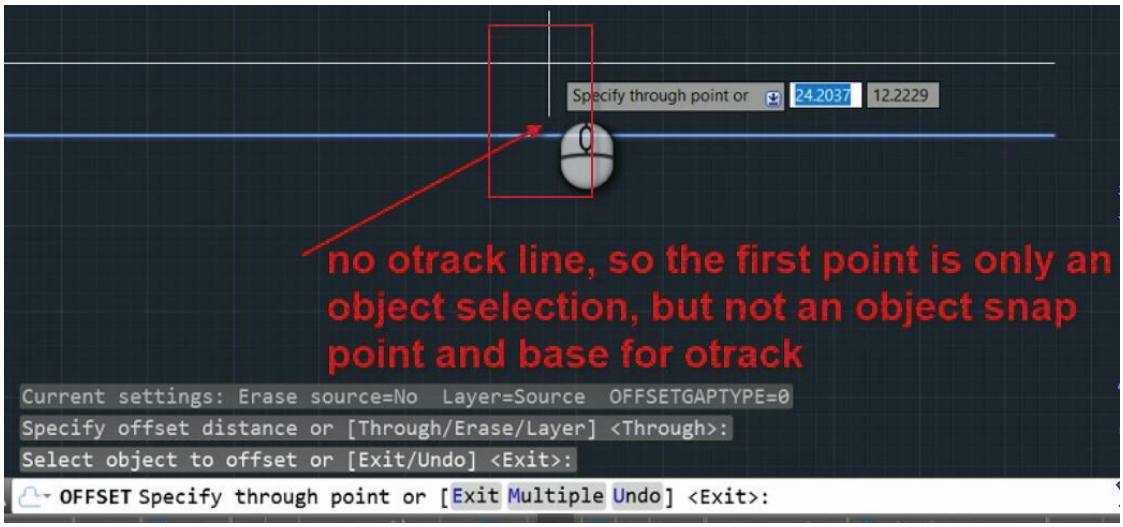
ii. Multiple

Enters the Multiple offset mode, which repeats the offset operation using the current offset distance.



iii. Through

Creates an object passing through a specified point



iv. Layer

Determines whether offset objects are created on the current layer or on the layer of the source object

1.4.3.5. Array

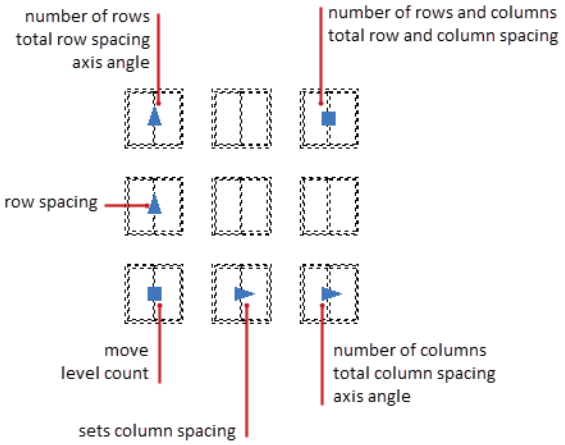
Creates copies of objects arranged in a pattern. You can create copies of objects in a regularly spaced rectangular, polar array.

Modify Manu	Modify Toolbar	Command Entry
Array		AR

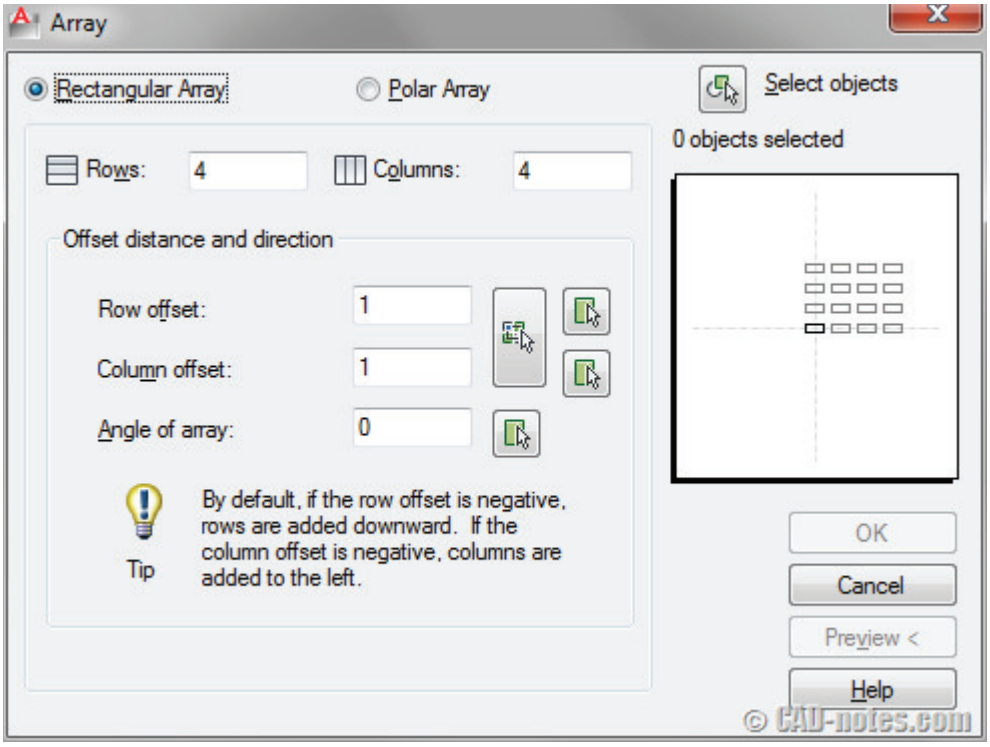
The following prompts are displayed.
Select objects
Specifies the object to be arrayed.

i. Rectangular

Distributes copies of the selected object into any combination of rows, columns, and levels (same as the ARRAYRECT command).

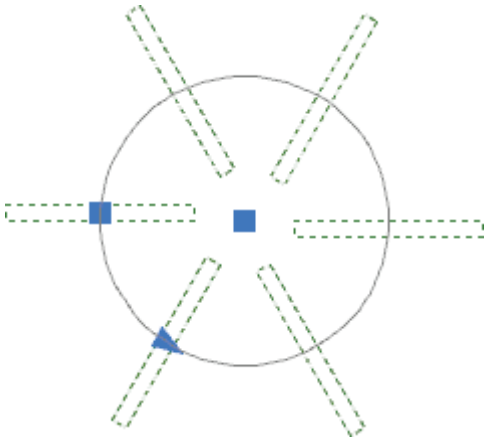


Command: Array
Enter Type of Array: rectangle then enter
Select object by window / click
Type number of Rows: 4 then enter
Type number of columns: 4 then enter
Row offset: 7 then enter
Column offset: 7 then
Angle of Array: 0 then enter

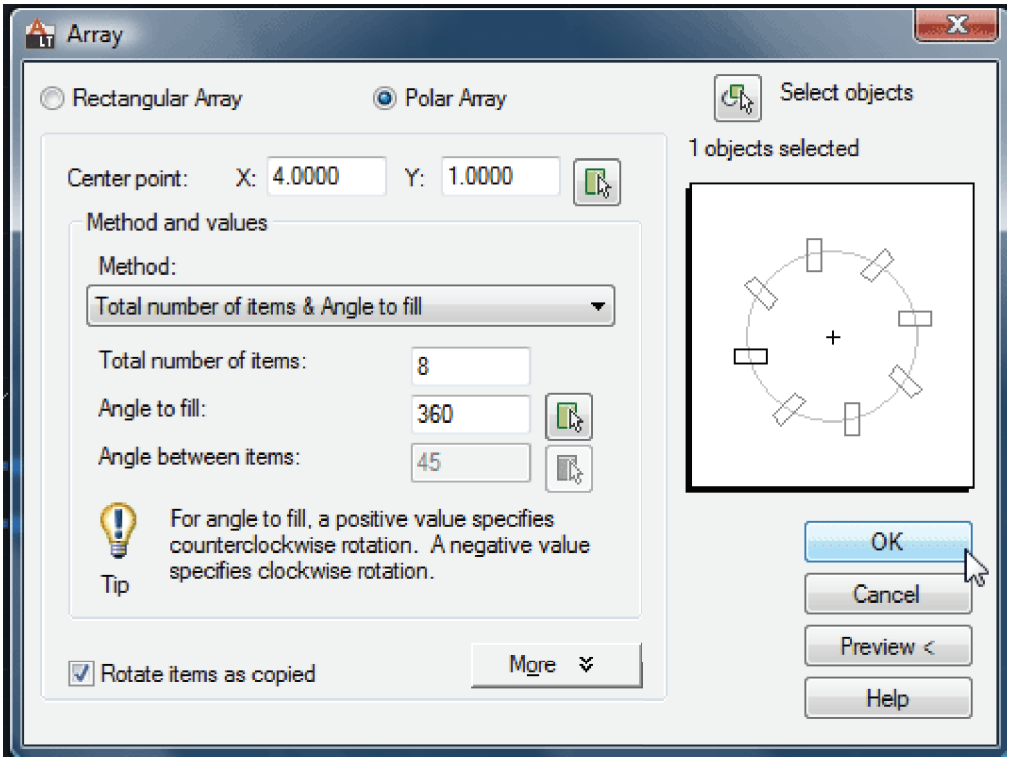


i. Polar

Evenly distributes copies of the object in a circular pattern around a center point or axis of rotation (same as the ARRAYPOLAR command).



Command: **Array**
Enter Type of Array: Polar array then enter
Select object by window / click
Specify the center point from object then enter
Type number of items: 10 then enter
Type the angle: 360° then enter

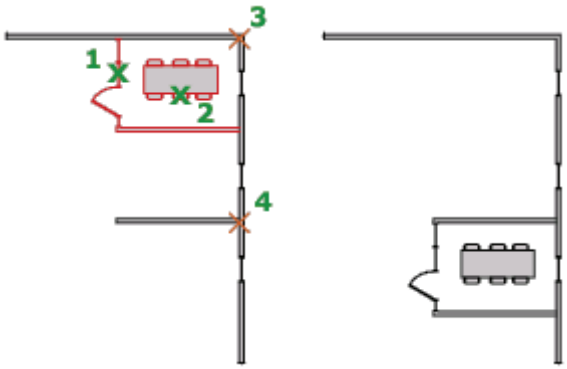


1.4.3.6. Move

Moves objects a specified distance in a specified direction

Modify Manu	Modify Toolbar	Command Entry
Move		M

Use coordinates, grid snaps, object snaps, and other tools to move objects with precision.



The following prompts are displayed.
Select objects
Specifies the object to be MOVE.

i. Base point
Specifies the start point for the move.

ii. Second point
In combination with the first point, specifies a vector that indicates how far, and in what direction, the selected objects are moved.

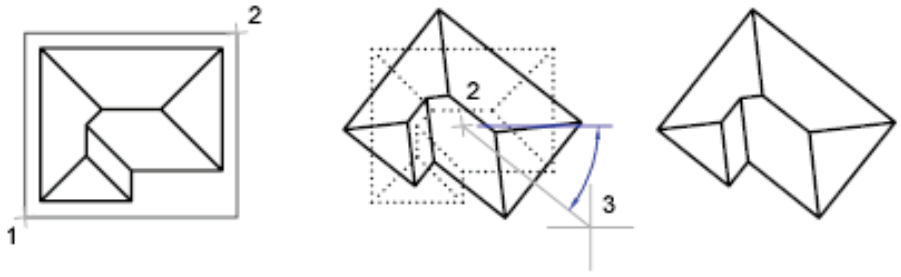
If you press Enter to accept the Use first point as displacement value, the first point is interpreted as a relative X, Y, Z displacement. For example, if you specify 2,3 for the base point and press Enter at the next prompt, the objects move 2 units in the X direction and 3 units in the Y direction from their current position.

iii. Displacement
Specify the displacement or distance object.

1.4.3.7. Rotate

Rotates objects around a base point. You can rotate selected objects around a base point to an absolute angle

Modify Manu	Modify Toolbar	Command Entry
Rotate		M



object selected | base point and angle of rotation | result

The following prompts are displayed.
Select objects
Specifies the object to be rotate

i. **Select objects**
Use an object selection method and press Enter when you finish.

ii. **Specify base point**
Specify a point.

iii. **Specify rotation angle**
Enter an angle, specify a point, enter c , or enter r.

iv. **Rotation Angle.**
Determines how far an object rotates around the base point. The axis of rotation passes through the specified base point and is parallel to the Z axis of the current UCS.

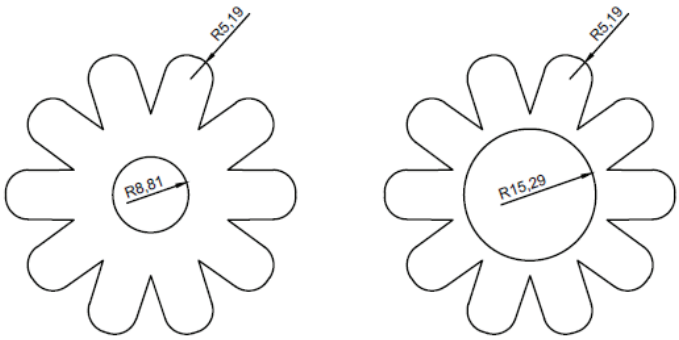
Copy.
Creates a copy of the selected objects for rotation.

Reference.
Rotates objects from a specified angle to a new, absolute angle. When you rotate a viewport object, the borders of the viewport remain parallel to the edges of the drawing area.

1.4.3.8. Scale

Enlarges or reduces selected objects, keeping the proportions of the object the same after scaling.

Modify Manu	Modify Toolbar	Command Entry
Scale		SC



The following prompts are displayed.
Select objects
Specifies the object to scale

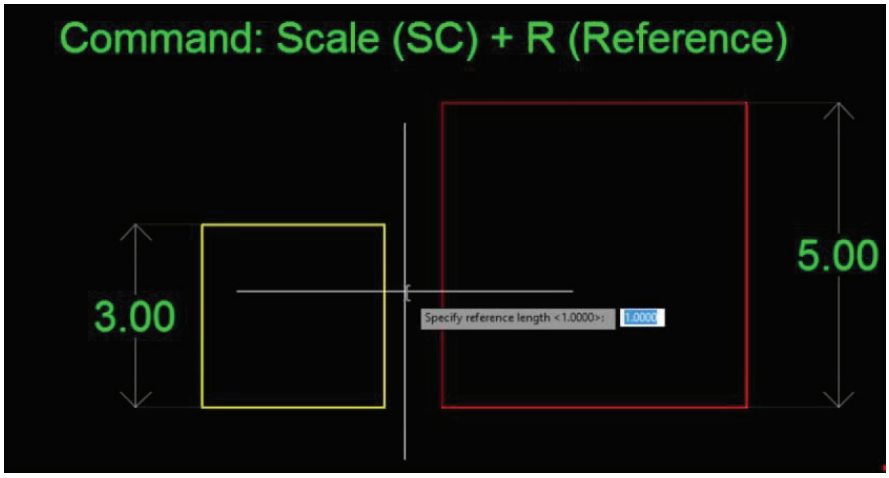
i. **Select objects**
Specifies which objects you want to resize.

ii. **Base point**
Specify a base point for the scale operation. The base point you specify identifies the point that remains in the same location as the selected objects change size (and thus move away from the stationary base point).

iii. **Scale Factor**
Multiplies the dimensions of the selected objects by the specified scale. A scale factor greater than 1 enlarges the objects. A scale factor between 0 and 1 shrinks the objects. You can also drag the cursor to make the object larger or smaller.

iv. **Copy**
Creates a copy of the selected objects for scaling.

v. **Reference**
Scales the selected objects based on a reference length and a specified new length.



1.4.3.9. Stretch

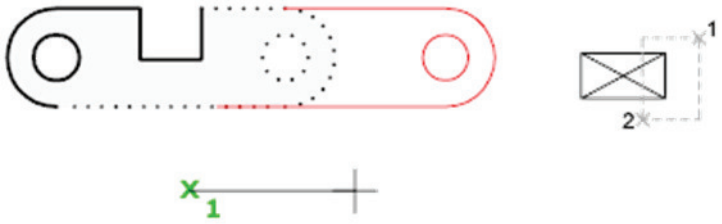
Stretches objects crossed by a selection window or polygon. Objects that are partially enclosed by a crossing window are stretched. Objects that are completely enclosed within the crossing window, or that are selected individually, are moved rather than stretched. Some types of objects such as circles, ellipses, and blocks, cannot be stretched.

Modify Manu	Modify Toolbar	Command Entry
Stretch		S

The following prompts are displayed.
Select objects
Specifies the object to stretch

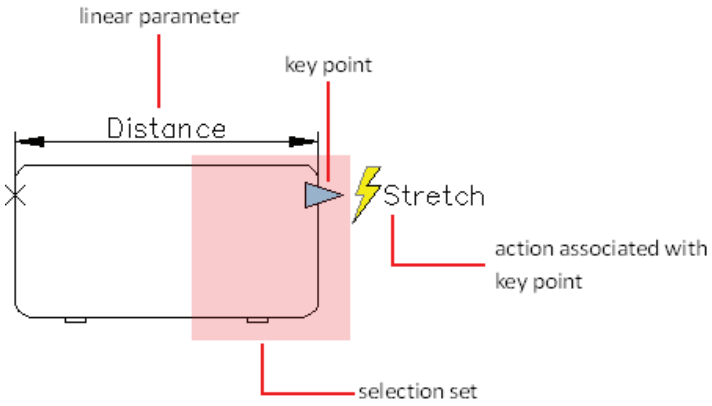
i. Select objects

Specifies the portion of the object that you want to stretch. Use. Press Enter when the selection is complete



ii. Displacement

Specifies the relative distance and direction of the stretch.

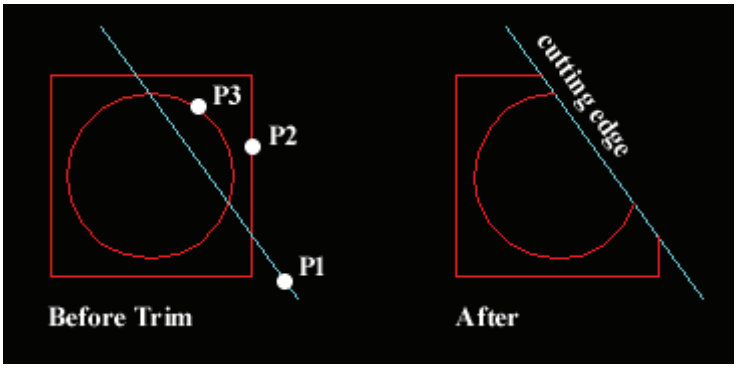


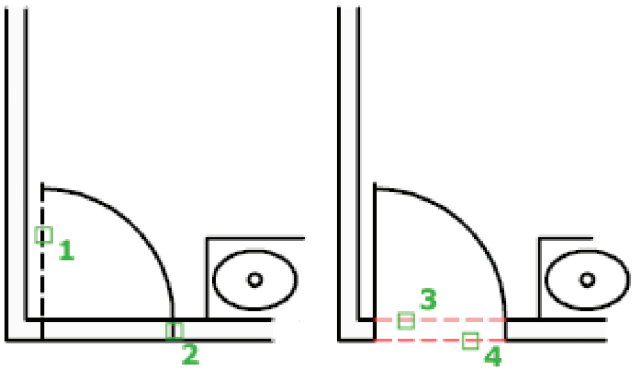
1.4.3.10. Trim

Trims objects to meet the edges of other objects

Modify Manu	Modify Toolbar	Command Entry
Trim		TR

To trim objects, select the boundaries. Then press Enter and select the objects that you want to trim. To use all objects as boundaries, press Enter at the first Select Objects prompt.



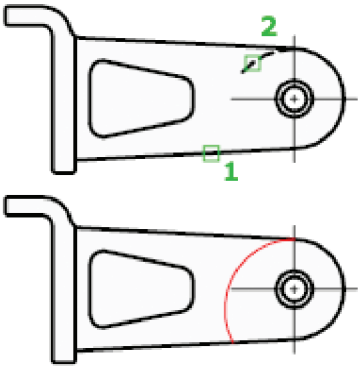


1.4.3.11. Extend

Extends objects to meet the edges of other objects.

Modify Manu	Modify Toolbar	Command Entry
Extend		EX

To trim objects, select the boundaries. Then press Enter and select the objects that you want to trim. To use all objects as boundaries, press Enter at the first Select Objects prompt.



Current settings: Projection = current, Edge = current
Select boundary edges...
Select objects or <select all>: Select one or more objects and press Enter, or press Enter to select all displayed objects
Select object to extend or shift-select to trim or [Fence/Crossing/Project/Edge/Undo]:
Select objects to extend, or hold down SHIFT and select an object to trim, or enter an option

- **Boundary Object Selection**
  Uses the selected objects to define the boundary edges to which you want to extend an object.

- **Object to Extend**
  Specifies the objects to extend. Press Enter to end the command.

- **Shift-Select to Trim**
  Trims the selected objects to the nearest boundary rather than extending them. This is an easy method to switch between trimming and extending.

- **Fence**
  Selects all objects that cross the selection fence. The selection fence is a series of temporary line segments that you specify with two or more fence points. The selection fence does not form a closed loop.

  Specify first fence point: Specify the starting point of the selection fence
  Specify next fence point or [Undo]: Specify the next point of the selection fence or enter "**u**"

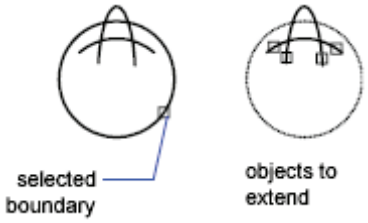
Specify next fence point or [Undo]: Specify the next point of the selection fence enter "**u"**, or press Enter

- **Crossing**
  Selects objects within and crossing a rectangular area defined by two points.

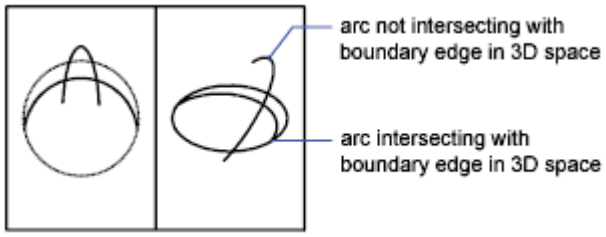
  Specify first corner: Specify a point
  Specify opposite corner: Specify a point at a diagonal from the first point

  Note: Some crossing selections of objects to be extended are ambiguous. EXTEND resolves the selection by following along the rectangular crossing window in a clockwise direction from the first point to the first object encountered.

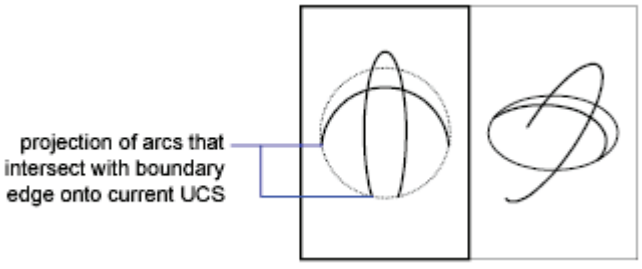
- **Project**
  Specifies the projection method used when extending objects.
  Enter a projection option [None/Ucs/View] <*current*>: *Enter an option or press* Enter



- **None**
  Specifies no projection. Only objects that intersect with the boundary edge in 3D space are extended.



- **UCS**
  Specifies projection onto the *XY* plane of the current user coordinate system (UCS). Objects that do not intersect with the boundary objects in 3D space are extended.



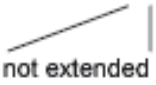
- **View**
  Specifies projection along the current view direction.

- **Edge**
  Extends the object to another object's implied edge, or only to an object that actually intersects it in 3D space.

  Enter an implied edge extension mode [Extend/No extend] <*current*>: *Enter an option or press* Enter

- **Extend**
  Extends the boundary object along its natural path to intersect another object or its implied edge in 3D space.

- **No Extend**
  Specifies that the object is to extend only to a boundary object that actually intersects it in 3D space.



- **Undo**
  Reverses the most recent changes made by EXTEND.

1.4.3.12. Break

Breaks the selected object between two points

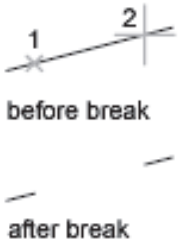
Modify Manu	Modify Toolbar	Command Entry
Break		BR

You can create a gap between two specified points on an object, breaking it into two objects. If the points are off of an object, they are automatically projected on to the object. BREAK is often used to create space for a block or text.

Select object: Use an object selection method, or specify the first break point (1) on an object. The prompts that are displayed next depend on how you select the object. If you select the object by using your pointing device, the program both selects the object and treats the selection point as the first break point. At the next prompt you can continue by specifying the second point or overriding the first point.
Specify second break point or [First point]: Specify the second break point (2) or enter " **f** "

i. **Second Break Point**
Specifies the second point to use to break the object.

ii. **First Point**
Overrides the original first point with the new point that you specify.
Specify first break point:
Specify second break point:

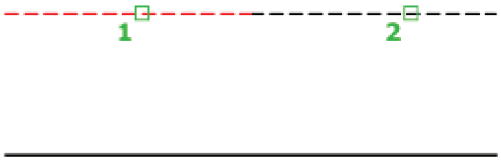


1.4.3.13. Join

Joins the endpoints of linear and curved objects to create a single object.

Modify Manu	Modify Toolbar	Command Entry
Join		J

Combines a series of finite linear and open curved objects at their common endpoints to create a single 2D or 3D object. The type of object that results depends on the types of objects selected, the type of object selected first, and whether the objects are coplanar.



1.4.3.14. Chamfer

Bevels the edges of objects

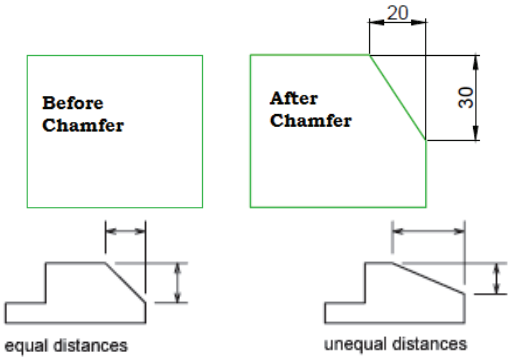
Modify Manu	Modify Toolbar	Command Entry
Chamfer		CHA

The distances and angles that you specify are applied in the order that you select the objects.

The following prompts are displayed.
Select objects
Specifies the object to chamfer

- **Polyline**
  Chamfers an entire 2D polyline. The intersecting polyline segments are chamfered at each vertex of the polyline. Chamfers become new segments of the polyline. If the polyline includes segments that are too short to accommodate the chamfer distance, those segments are not chamfered.

- **Distance**
  Sets the distance of the chamfer from the endpoint of the selected edge.
  If you set both distances to zero, CHAMFER extends or trims the two lines so they end at the same point.



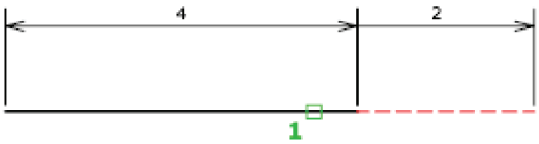
- **Angle**
  Sets the chamfer distances using a chamfer distance for the first line and an angle for the second line.

1.4.3.15. lengthen

Changes the length of objects and the included angle of arcs.

Modify Manu	Modify Toolbar	Command Entry
lengthen		Len

You can specify changes as a percentage, an increment, or as a final length or angle. LENGTHEN is an alternative to using TRIM or EXTEND.

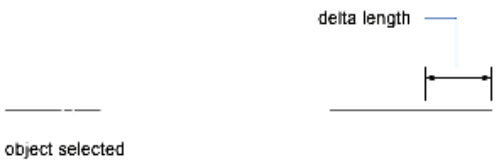


Select an object or [DElta/Percent/Total/DYnamic]: Select one object or enter an option

- **Object Selection**
  Displays the length and, where applicable, the included angle of the object.
  LENGTHEN does not affect closed objects. The extrusion direction of the selected object need not be parallel to the Z axis of the current user coordinate system (UCS).
  Current length: <current>, included angle: <current>
  Select an object or [DElta/Percent/Total/DYnamic]: Select one object, enter an option, or press ENTER to end the command

- **Delta**
  Changes the length of an object by a specified increment, measured from the endpoint that is closest to the selection point. Delta also changes the angle of an arc by a specified increment, measured from the endpoint that is closest to the selection point. A positive value extends the object; a negative value trims it.
  Enter delta length or [Angle] <current>: Specify a distance, enter **a**, or press ENTER

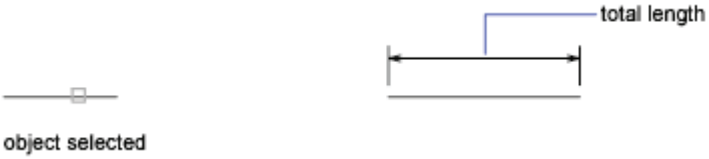
- **Delta Length**
  Changes the length of the object by the specified increment.
  Select an object to change or [Undo]: Select one object or enter **u**
  The prompt repeats until you press ENTER to end the command.



- **Angle**
  Changes the included angle of the selected arc by the specified angle.
  Enter delta angle <current>: Specify an angle or press ENTER
  Select an object to change or [Undo]: Select one object or enter **u**
  The prompt repeats until you press ENTER to end the command.

- **Percent**
  Sets the length of an object by a specified percentage of its total length.
  Enter percentage length <current>: Enter a positive nonzero value or press ENTER
  Select an object to change or [Undo]: Select one object or enter **u**
  The prompt repeats until you press ENTER to end the command.

- **Total**
  Sets the length of a selected object by specifying the total absolute length from the fixed endpoint. Total also sets the included angle of a selected arc by a specified total angle.
  Specify total length or [Angle] <current>: Specify a distance, enter a positive nonzero value, enter **a**, or press ENTER



- **Total Length**
  Lengthens the object to the specified value from the endpoint that is closest to the selection point.
  Select an object to change or [Undo]: Select one object or enter **u**
  The prompt repeats until you press ENTER to end the command.

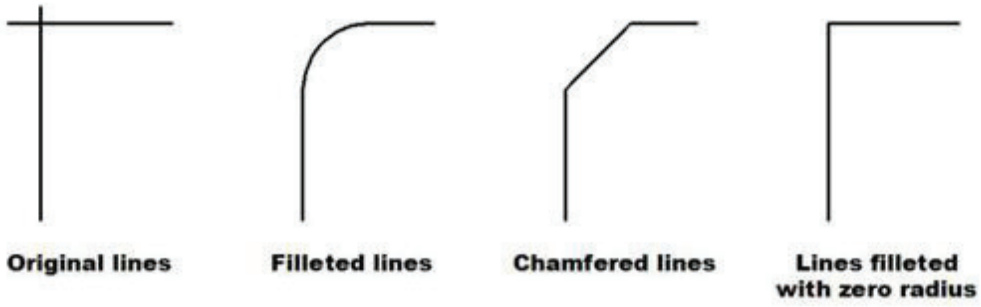
- **Angle**
  Sets the included angle of the selected arc.
  Specify total angle <current>: Specify an angle or press ENTER
  Select an object to change or [Undo]: Select one object or enter **u**
  The prompt repeats until you press ENTER to end the command.

- **Dynamic**
  Turns on Dynamic Dragging mode. You change the length of a selected object by dragging one of its endpoints. The other end remains fixed.
  Select an object to change or [Undo]: Select one object or enter **u**
  The prompt repeats until you press ENTER to end the command.

1.4.3.16. Fillet

Rounds and fillets the edges of objects

Modify Manu	Modify Toolbar	Command Entry
Fillet		Fillet



Command: FILLET
Current settings: Mode = TRIM, Radius = 0'-0"
Select first object or [Undo/Polyline/Radius/Trim/Multiple]

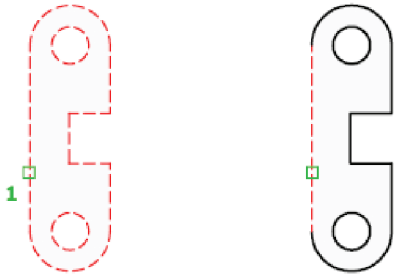
Undo: To undo the last action
Polyline: To work with polyline filleting
Radius: Specify fillet radius
Trim: Enter Trim mode option
Multiple: To multiple set of objects

1.4.3.17. Explode

Breaks a compound object into its component objects

Modify Manu	Modify Toolbar	Command Entry
Explode		X

Explodes a compound object when you want to modify its components separately. Objects that can be exploded include blocks, polylines, and regions, among others.



The color, line type, and line weight of any exploded object might change. Other results differ depending on the type of compound object you're exploding. See the following list of objects that can be exploded and the results for each.
To explode objects and change their properties at the same time, use XPLODE.

Note: If you're using a script or an Object ARX® function, you can explode only one object at a time.

- **2D and Lightweight Polyline**
  Discards any associated width or tangent information. For wide polylines, the resulting lines and arcs are placed along the center of the polyline.

- **3D Polyline**
  Explodes into line segments. Any line type assigned to the 3D polyline is applied to each resulting line segment.

- **3D Solid**
  Explodes planar faces into regions. Nonplanar faces explode into surfaces.

- **Annotative Objects**
  Explodes the current scale representation into its constituent parts which are no longer annotative. Other scale representations are removed.

- **Arc**
  If within a nonuniformly scaled block, explodes into elliptical arcs.

- **Block**
  Removes one grouping level at a time. If a block contains a polyline or a nested block, exploding the block exposes the polyline or nested block object, which must then be exploded to expose its individual objects.
  Blocks with equal *X*, *Y*, and *Z* scales explode into their component objects. Blocks with unequal *X*, *Y*, and *Z* scales (nonuniformly scaled blocks) might explode into unexpected objects.
  When nonuniformly scaled blocks contain objects that cannot be exploded, they are collected into an anonymous block (named with a “*E” prefix) and referenced with the nonuniform scaling. If all the objects in such a block cannot be exploded, the selected block reference will not be exploded. Body, 3D Solid, and Region entities in a nonuniformly scaled block cannot be exploded.
  Exploding a block that contains attributes deletes the attribute values and redisplays the attribute definitions.

Blocks inserted with MINSERT and external references (xrefs) and their dependent blocks cannot be exploded.

- **Body**
  Explodes into a single-surface body (nonplanar surfaces), regions, or curves.

- **Circle**
  If within a nonuniformly scaled block, explodes into ellipses.

- **Leaders**
  Explodes into lines, splines, solids (arrow heads), block inserts (arrow heads, annotation blocks), multiline text, or tolerance objects, depending on the leader.

- **Mesh Objects**
  Explodes each face into a separate 3D face object. Color and materials assignments are retained.

- **Multiline Text**
  Explodes into text objects.

- **Multiline**
  Explodes into lines and arcs.

- **Polyface Mesh**
  Explodes one-vertex meshes into a point object. Two-vertex meshes explode into a line. Three-vertex meshes explode into 3D faces.

- **Region**
  Explodes into lines, arcs, or splines.

1.4.4. Dimension Toolbar

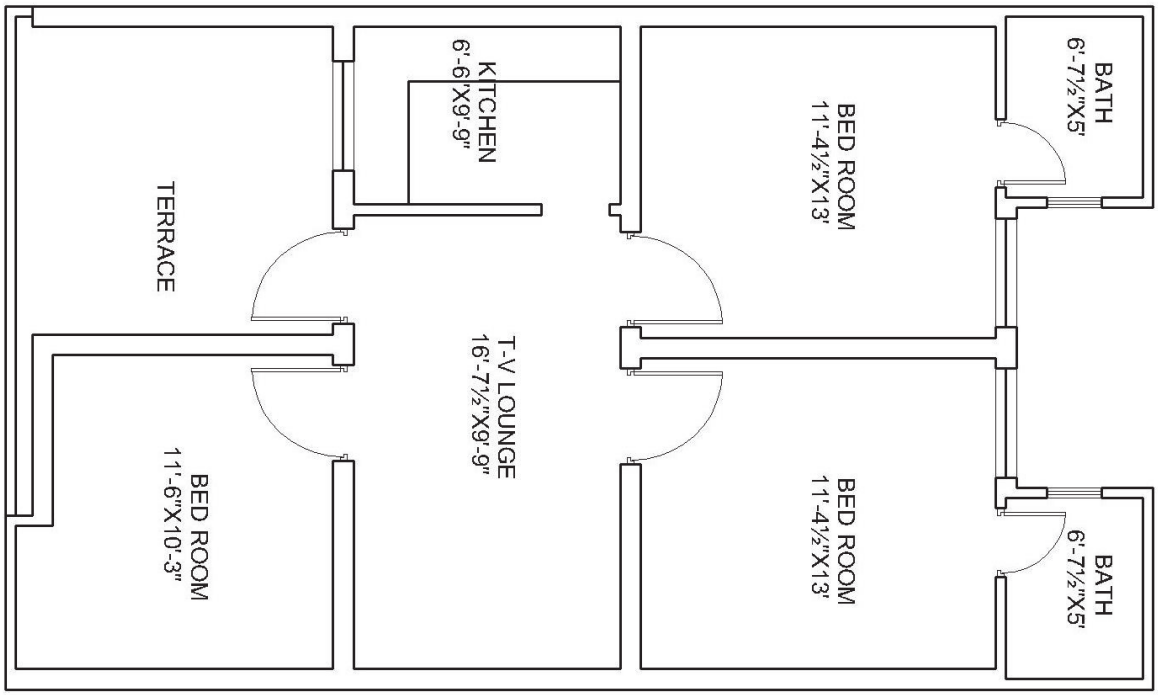
Dimension Menu	Dimension Toolbar	Command Entry
Quick Dimension		QDIM
Linear Dimension		DLI
Radius Dimension		DRA
Angular Dimension		DAN
Arc Dimension		DIMARC
Diameter Dimension		DDI
Jojjed Dimension		JOG
Ordinate Dimensions		DOR
Continue Dimension		DCO
Base Line Dimension		DBA
Associate Dimension		DRE

1.5. Edit 2D Object to meet set standards

Practice =1

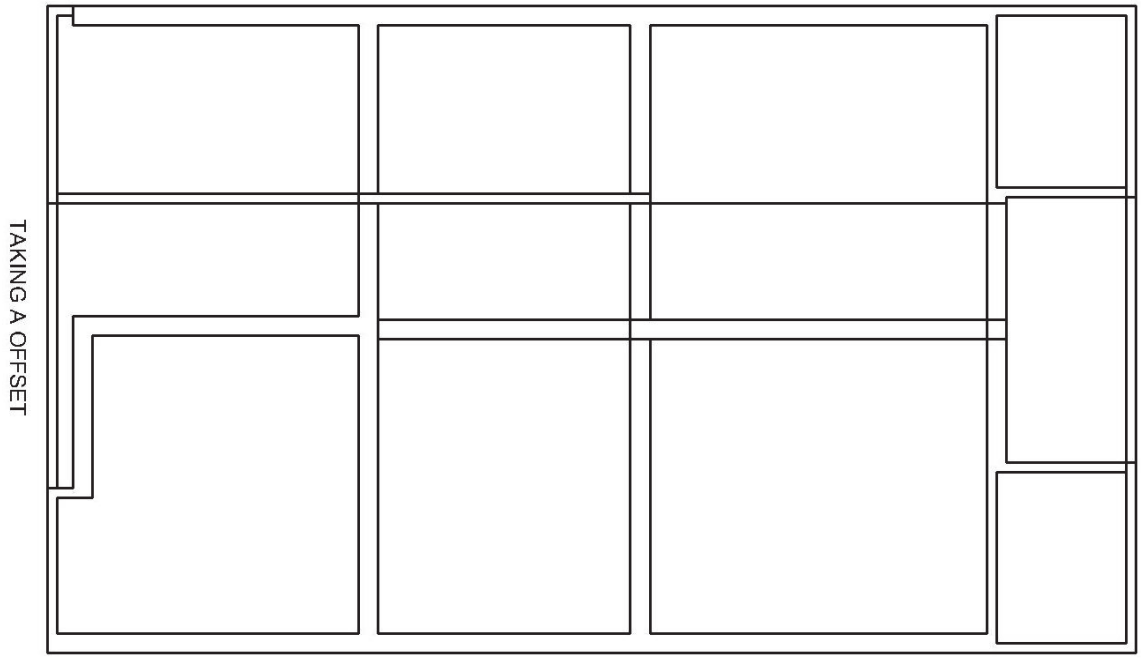
Create 2D 'House Plan' in AutoCAD having dimensions of the plan given below with the following requirements.

i. Three Bed Rooms, including two bed room with attached baths
ii. One kitchen
iii. TV Lounge (As per space)
iv. Car Porch (Terrace)
v. Proper Ventilation
vi. Space Utilization

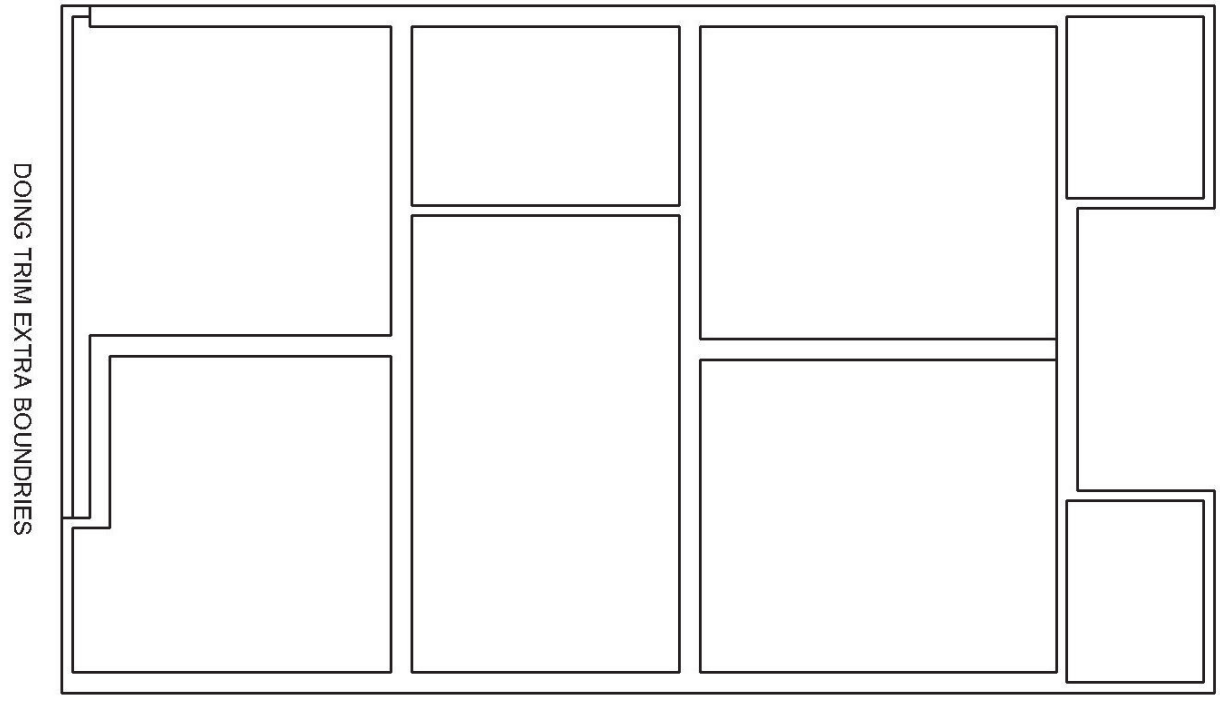


Step 1: Draw rectangle equal to house plan as above

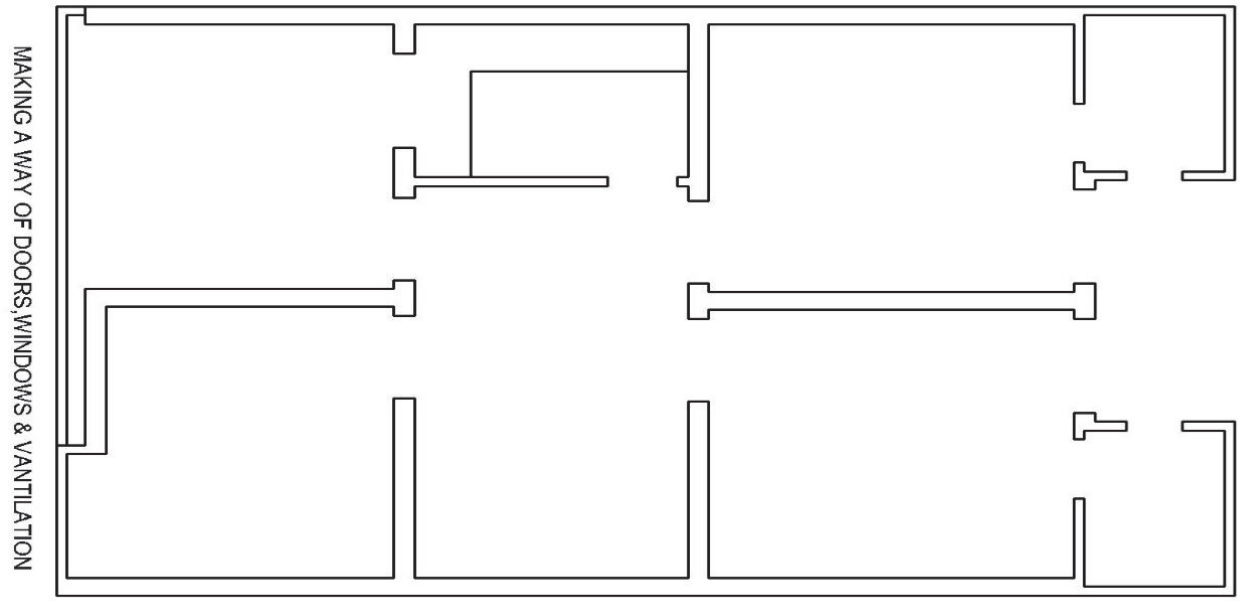
Step 2: Apply Offset



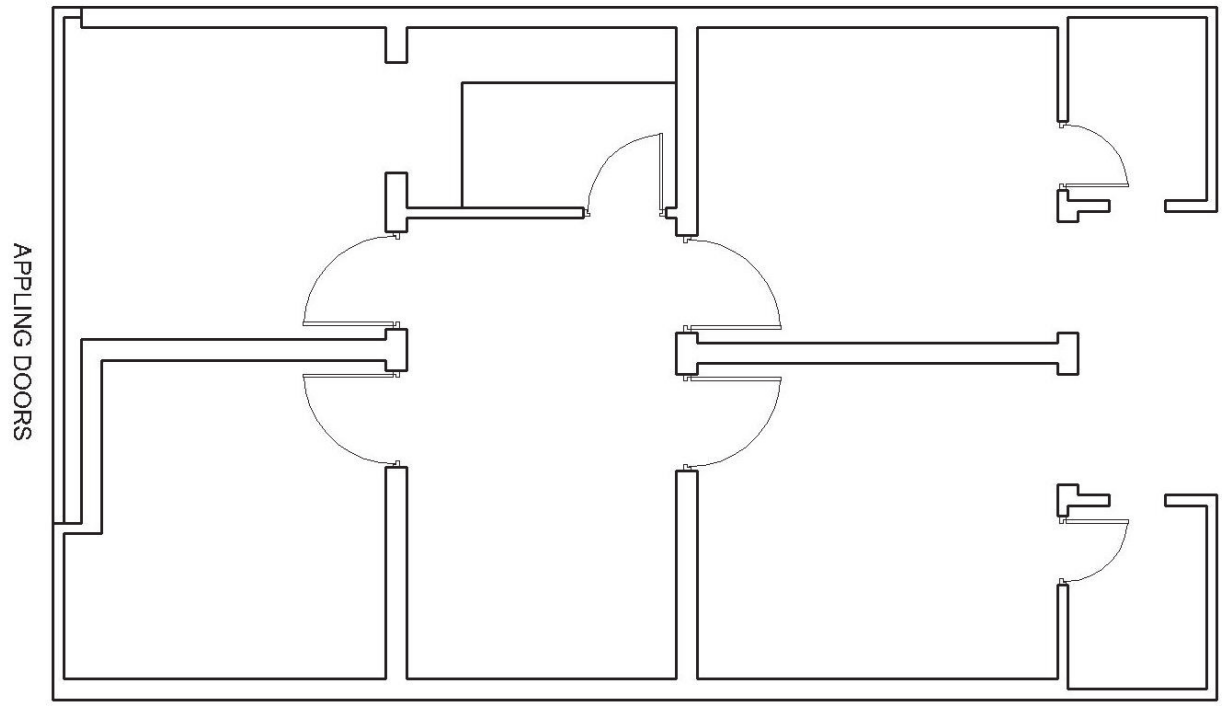
Step 3: Trim extra edges



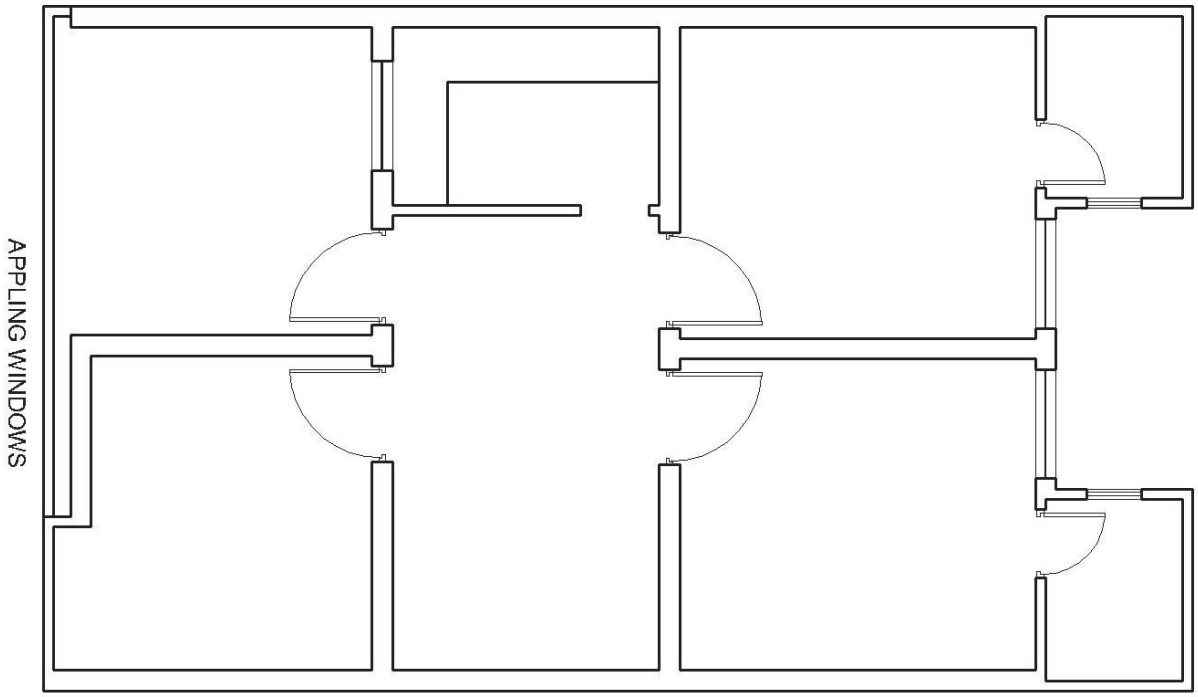
Step 4: Apply Trim, Extend, and Erase command for doors



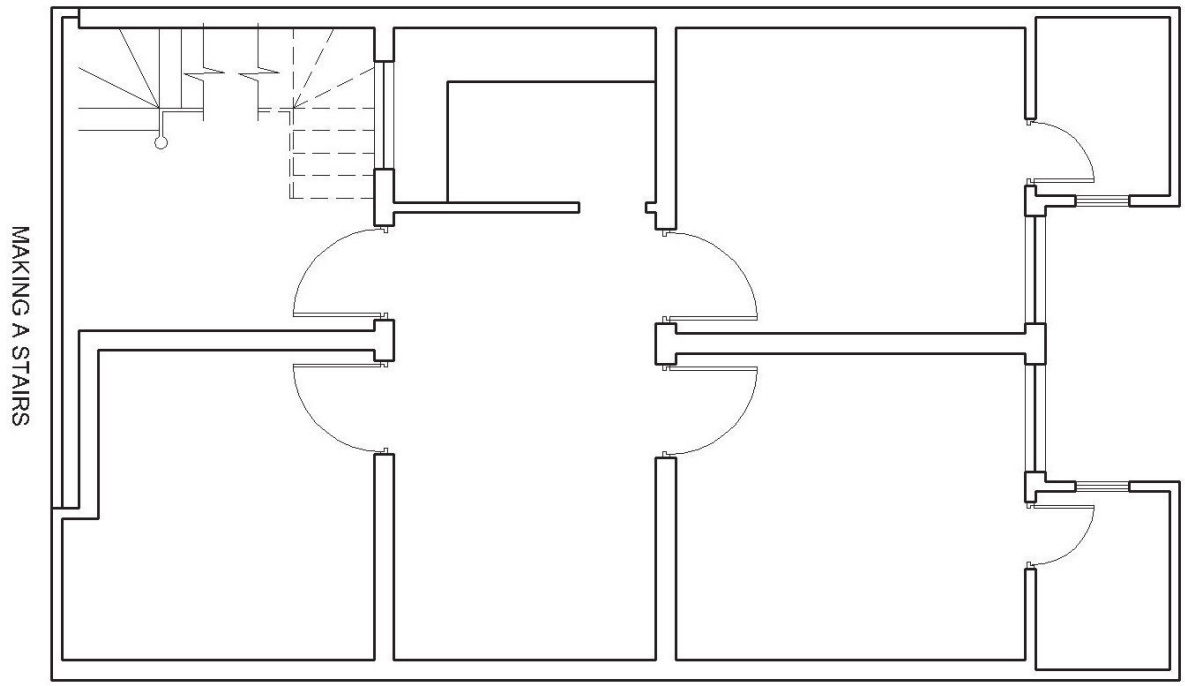
Step 5: Apply Circle Command for doors



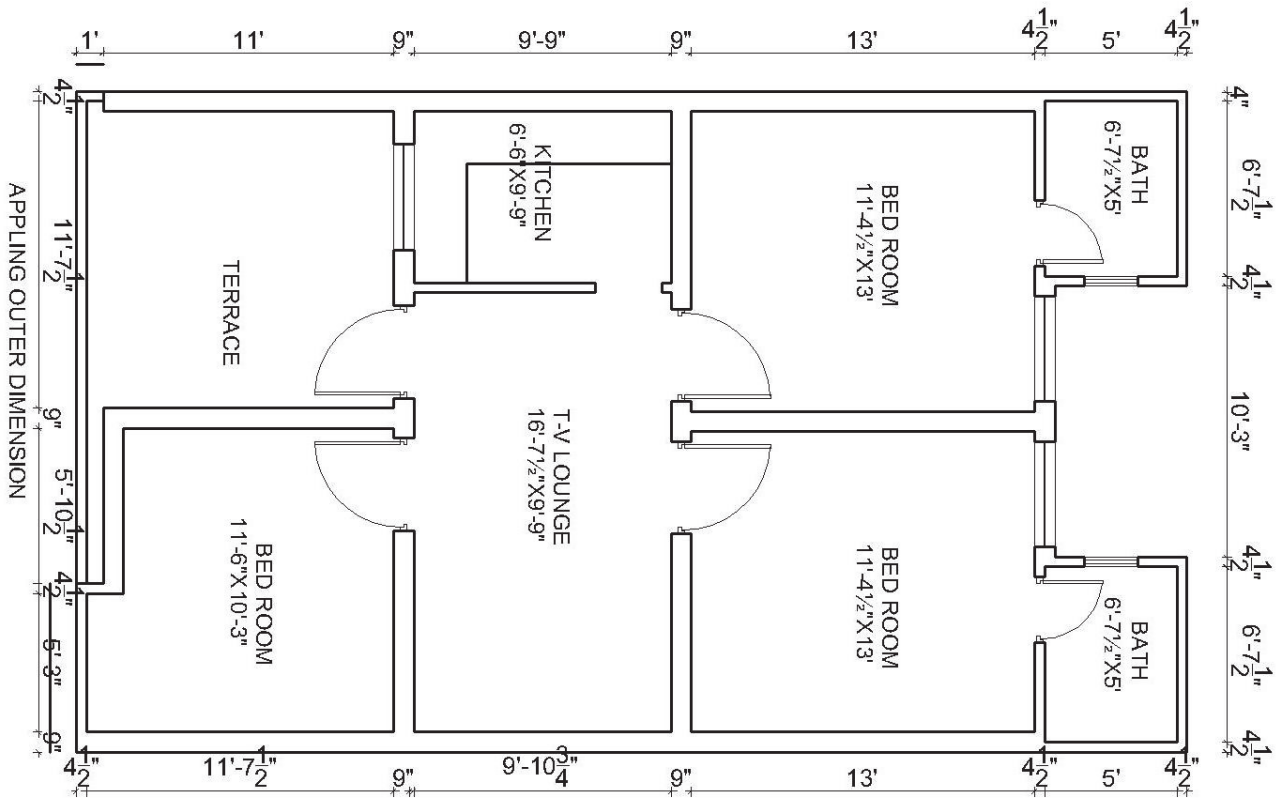
Step 6: Apply Offset command for windows and trim the extra lines.
Change the line thickness of walls at the locations of windows.



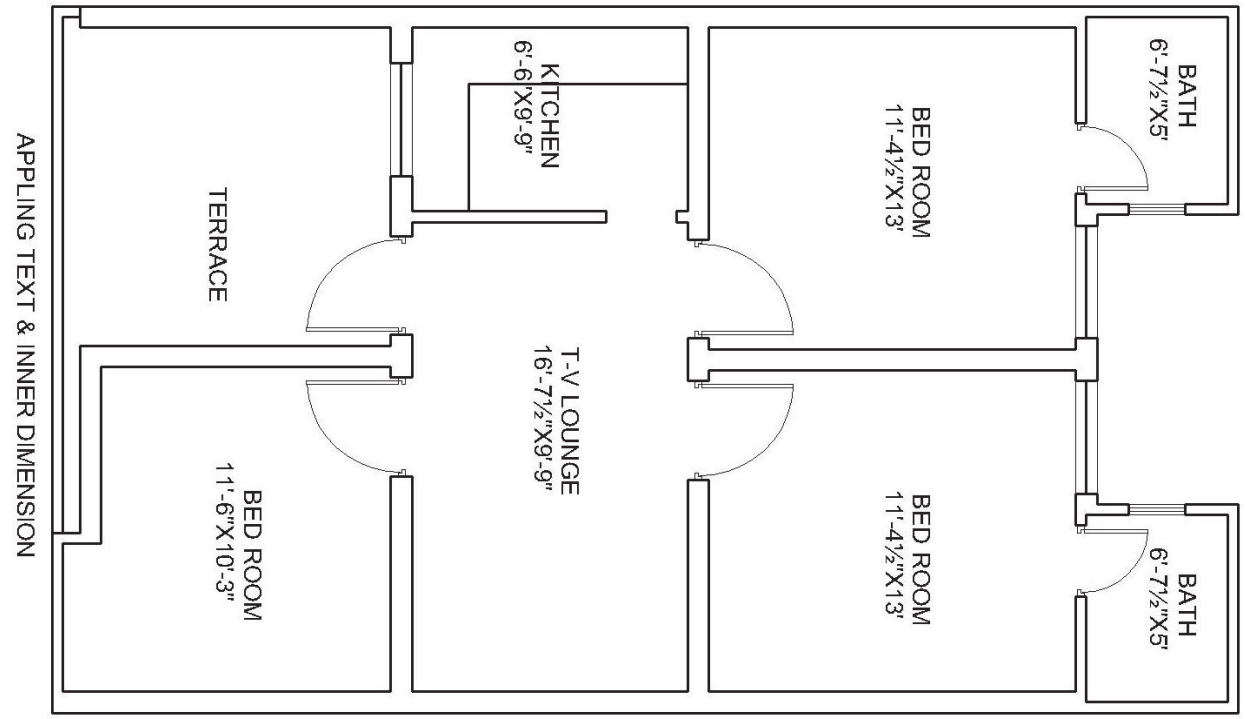
Step 7: Draw Stairs by using offset and trim command

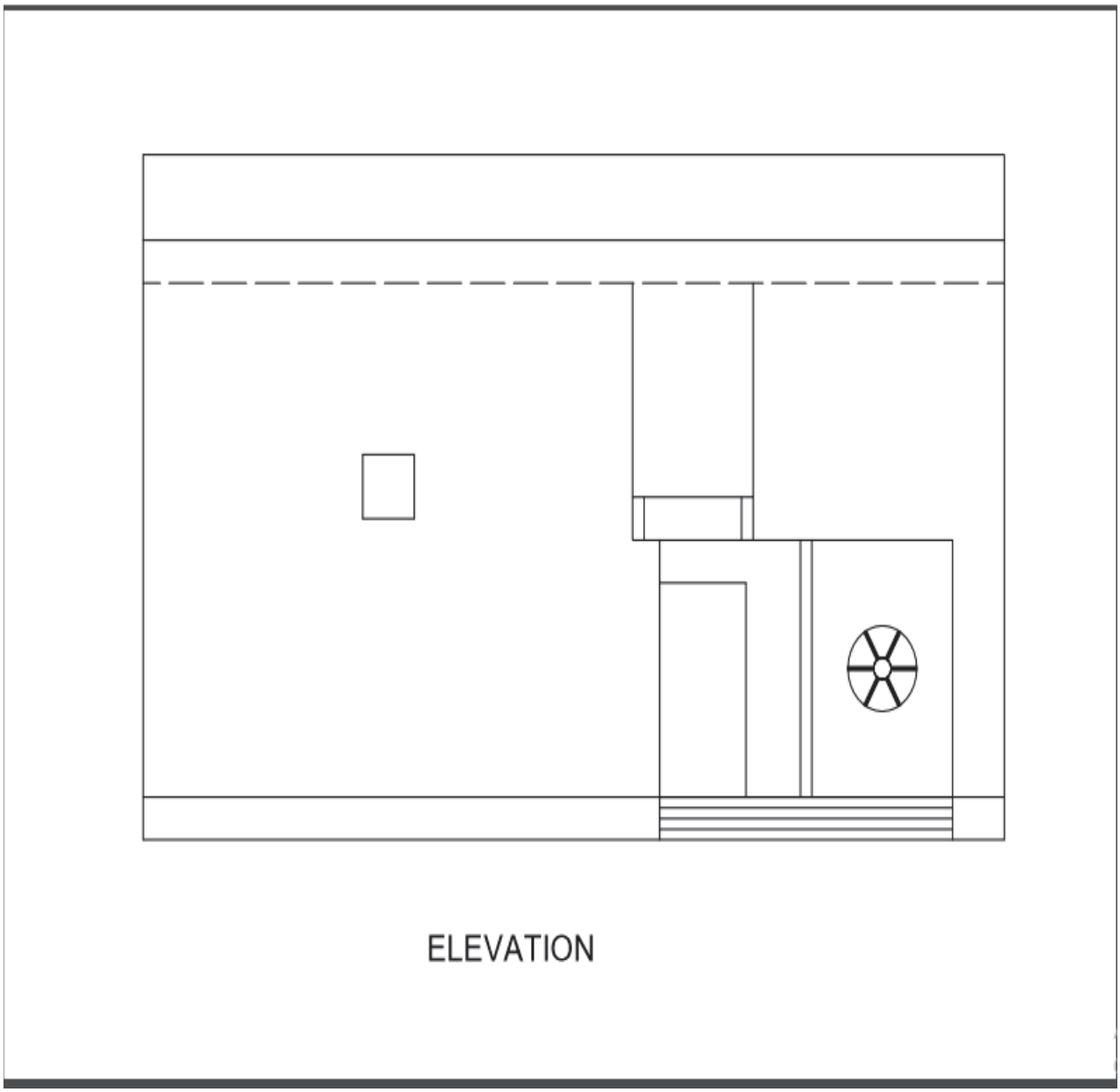


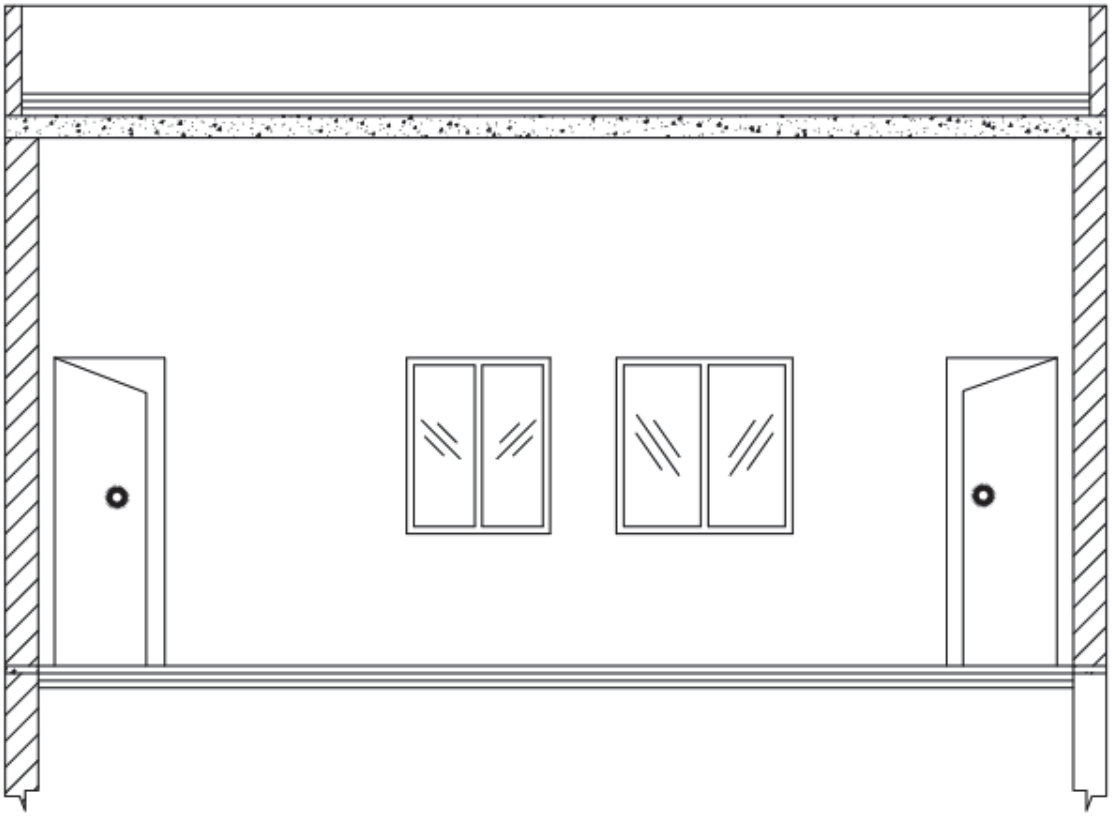
Step 8: taking Dimension by using linear dimension commands



Step 9: Write text by using Text command



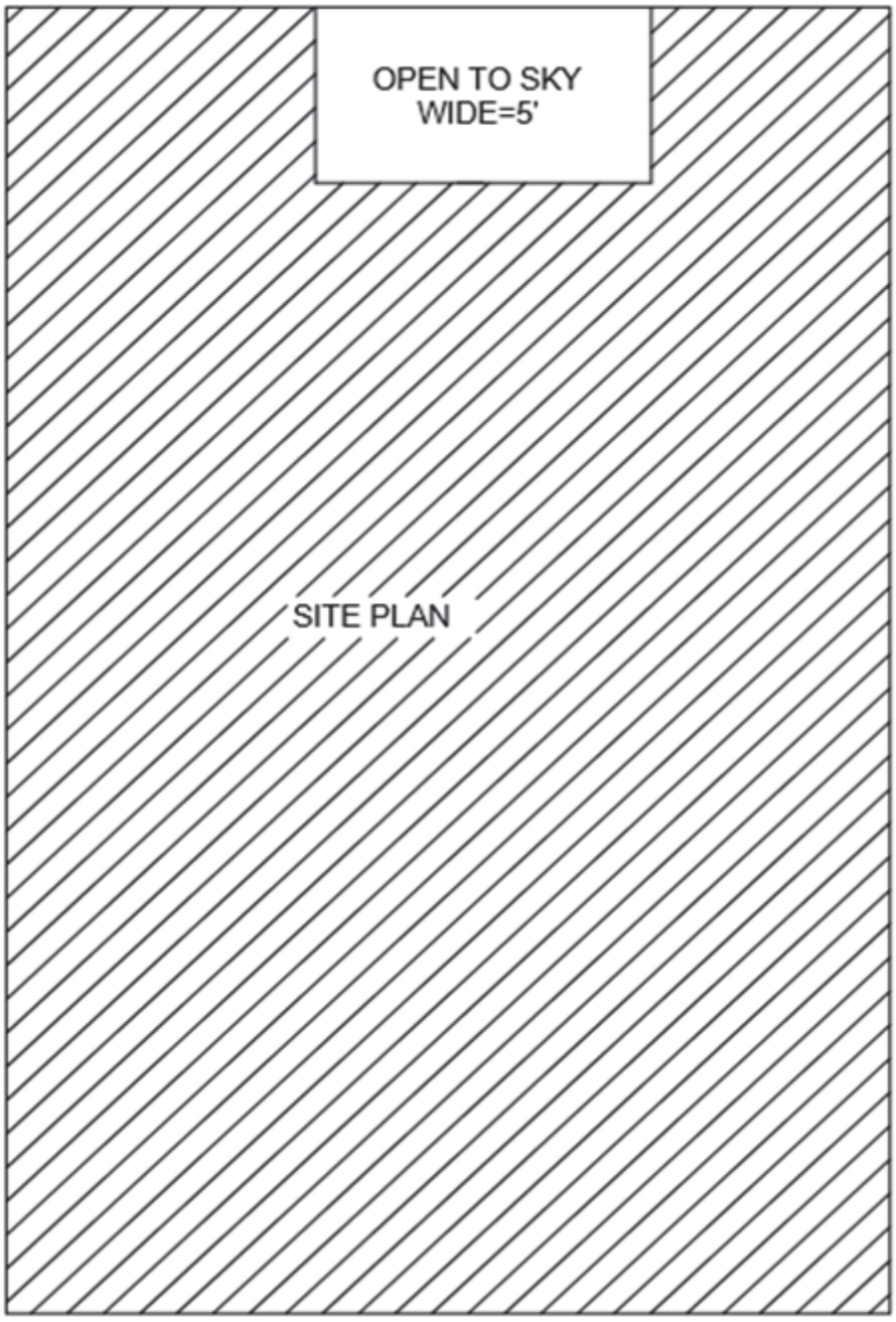

ELEVATION

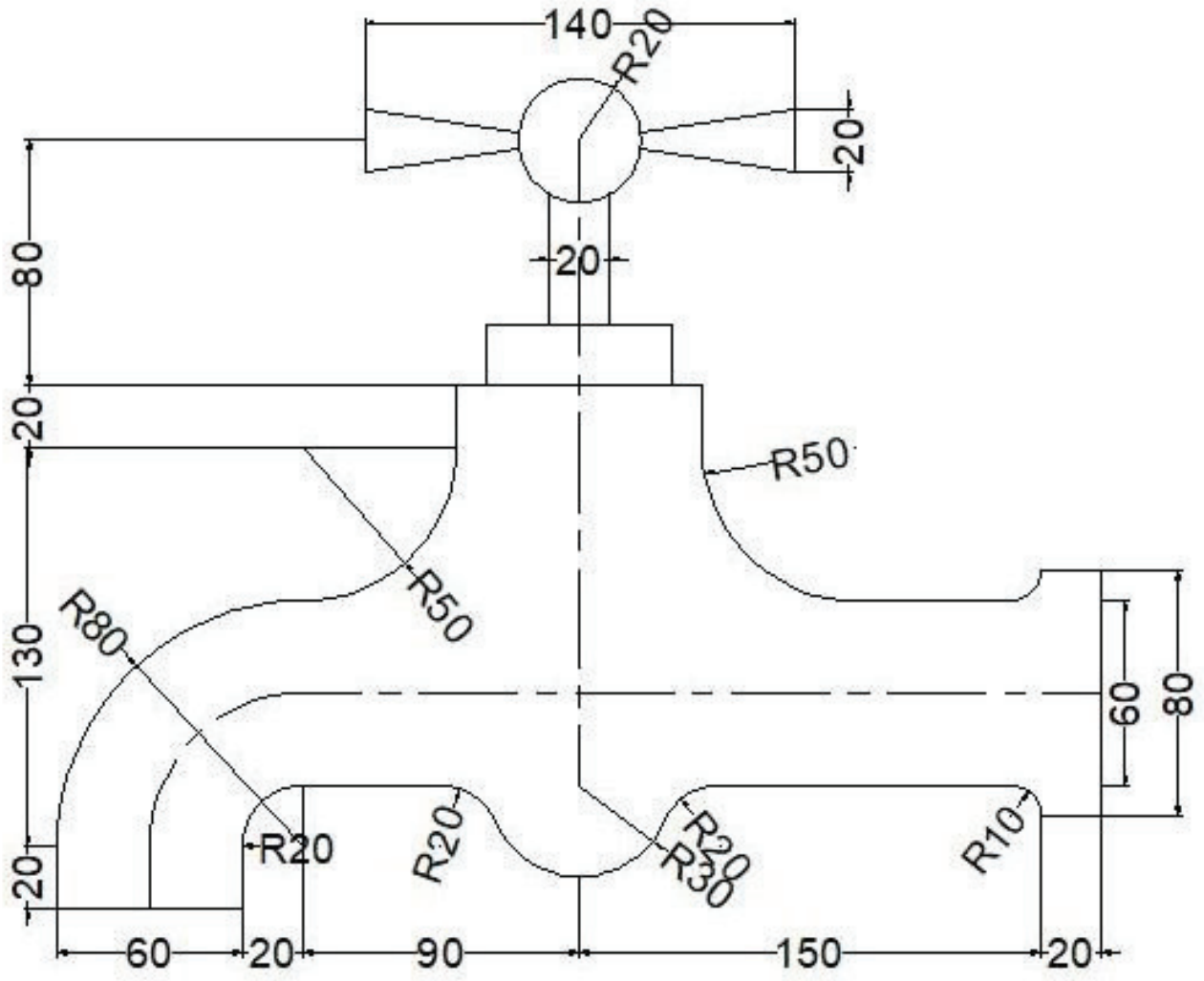


SECTION

Practice-2

Part-a
Prepare the following object with its defined dimension.

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WATER TAP

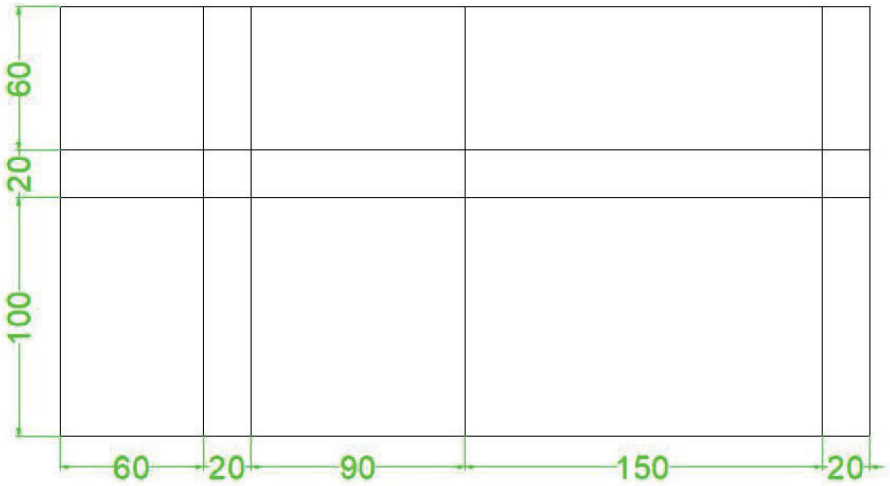
Step 1:

i. Open the template acadiso.dwt.

ii. Perform drafting settings i.e. format units to decimal with accuracy of 01 mm. create 3 text styles using arial fonts of text height 10 mm, 15 mm & 20 mm. Load line centre line and create layers i.e. Object, centre line, text, dimension.

iii. Draw a line 340 mm long horizontally taking its origin point at 50, 120 and a line 180 mm long vertically up from the same coordinates.

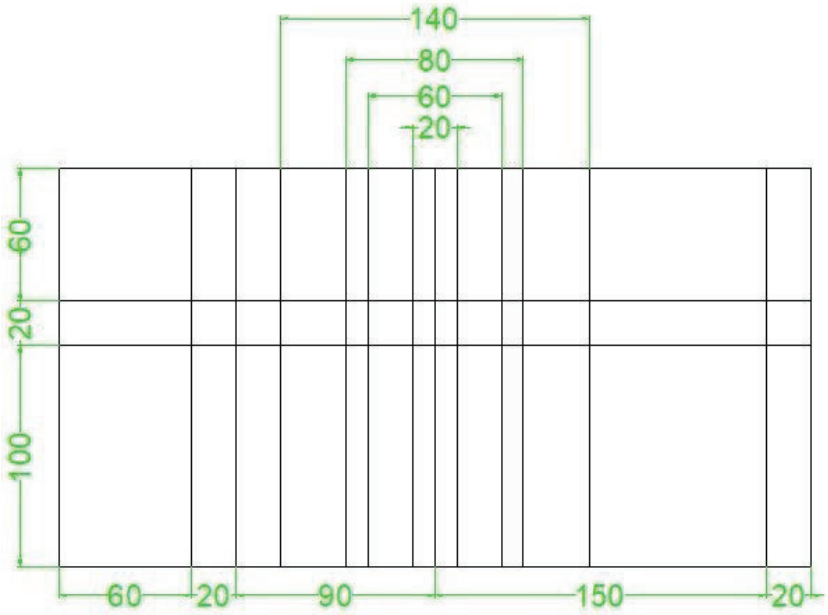
iv. Now take off sets for vertical line to the right and for horizontal line to the upside as shown in the following figure step one:



STEP-1

Step 2:

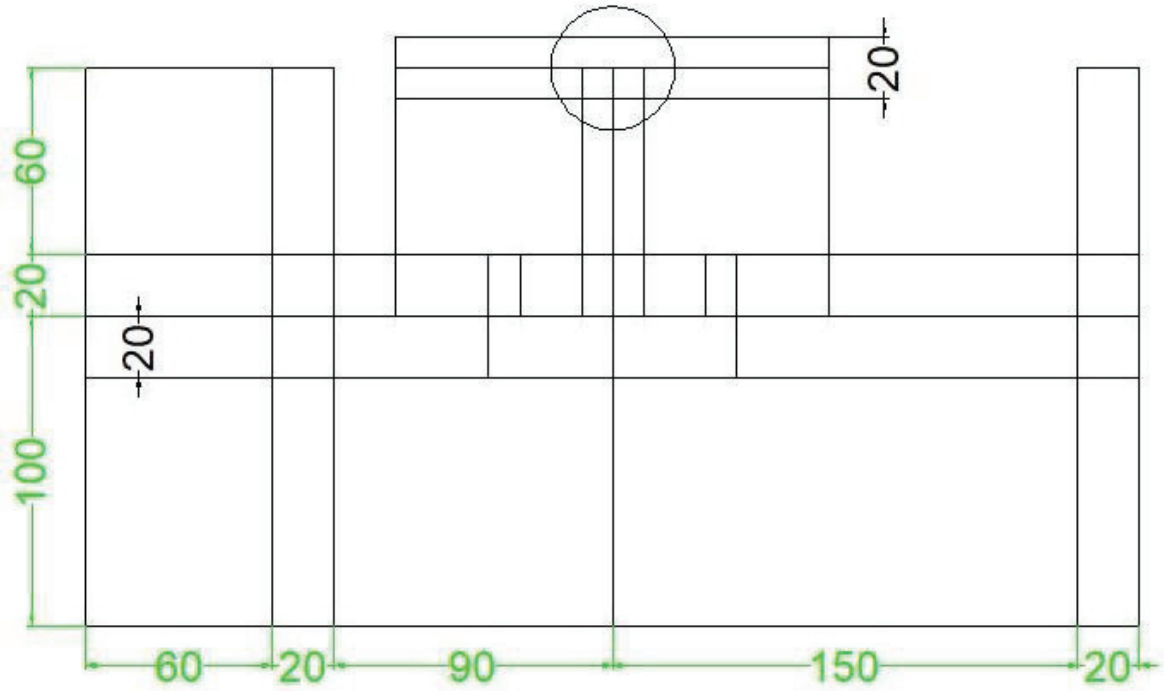
i. Take offsets of vertical centre line on both sides for the distances as 10 mm, 30 mm, 40 mm & 70 mm as shown in the figure below Step-2..



STEP-2

Step 3:

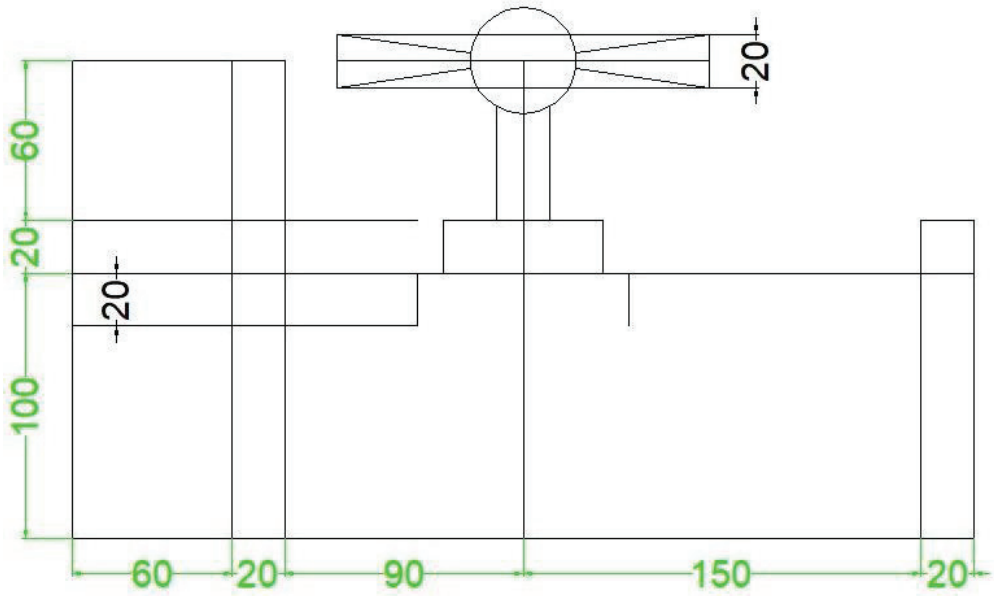
i. Draw a circle of radius 20 mm at top of centre line. Take an offset of 20 mm to downward of second line from bottom. Take off sets on both side of top horizontal line to create knob. Then trim the lines as per figure given below STEP-3.



STEP-3

Step:4

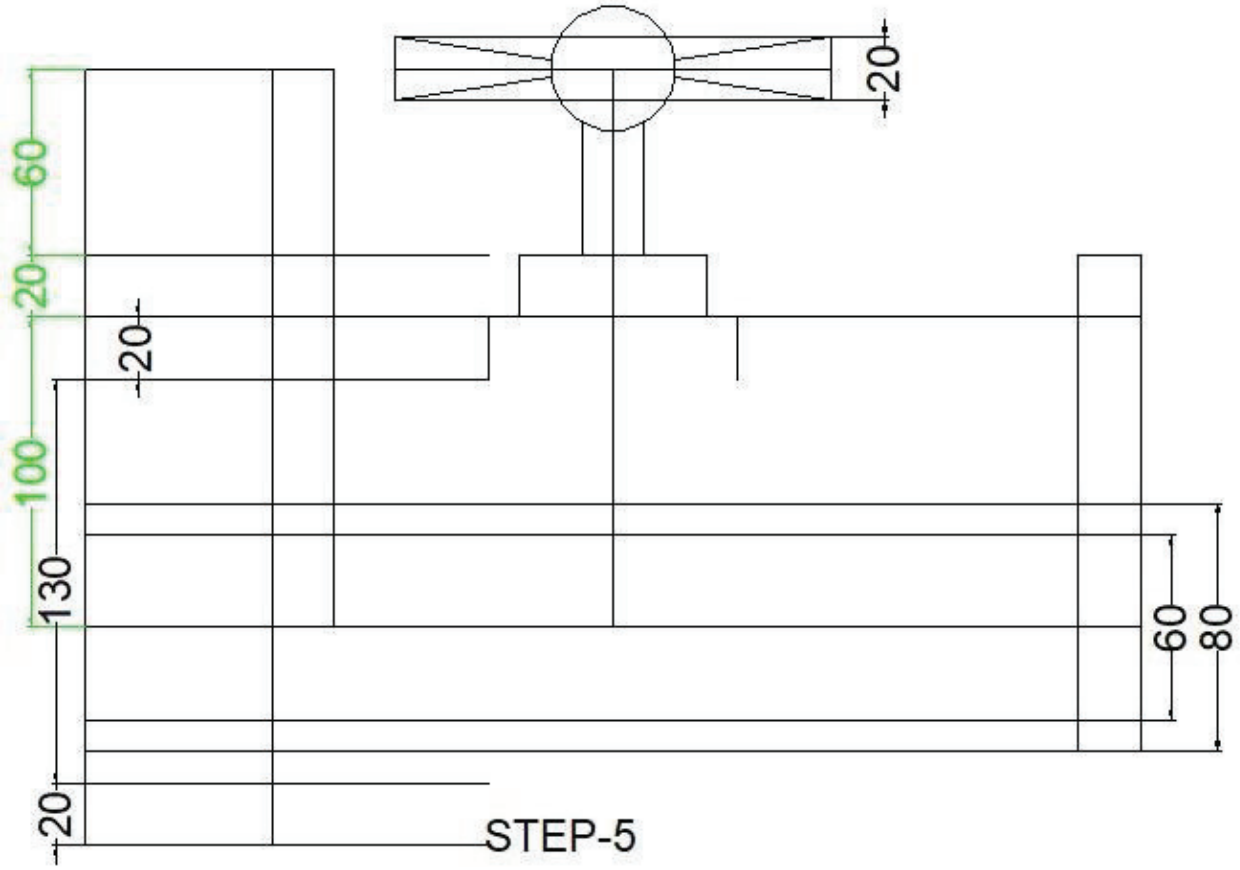
i. Draw inclined lines from centre of circle and trim the lines as given in figure Step-4



STEP-4

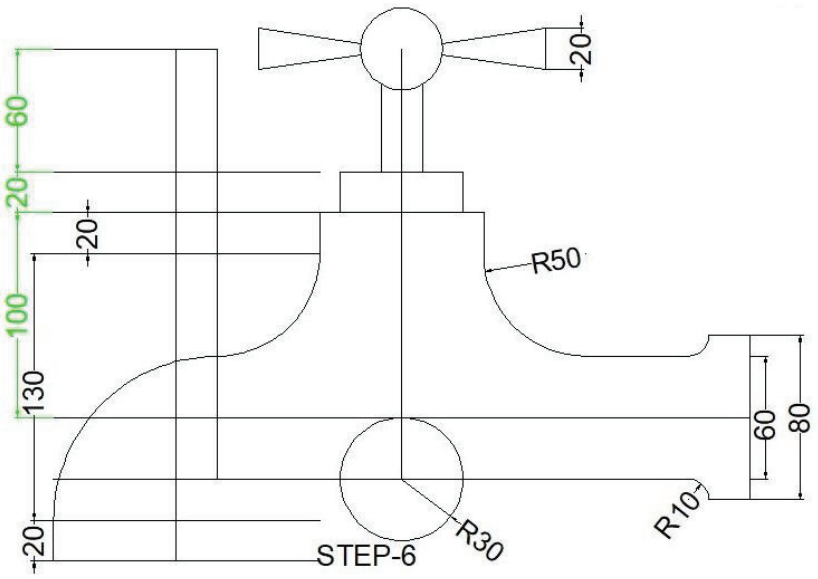
Step:5

i. Take the offsets to upward and downward of the bottom line for a distance of 30 mm and 40 mm.
ii. Take the offset to downwards for a distance of 130 mm
iii. Further take offset for a distance of 20 mm of this created line (line through offset command).
iv. Extend the vertical lines upto the bottom line
v. Trim accordingly as shown in the figure below Step-5.



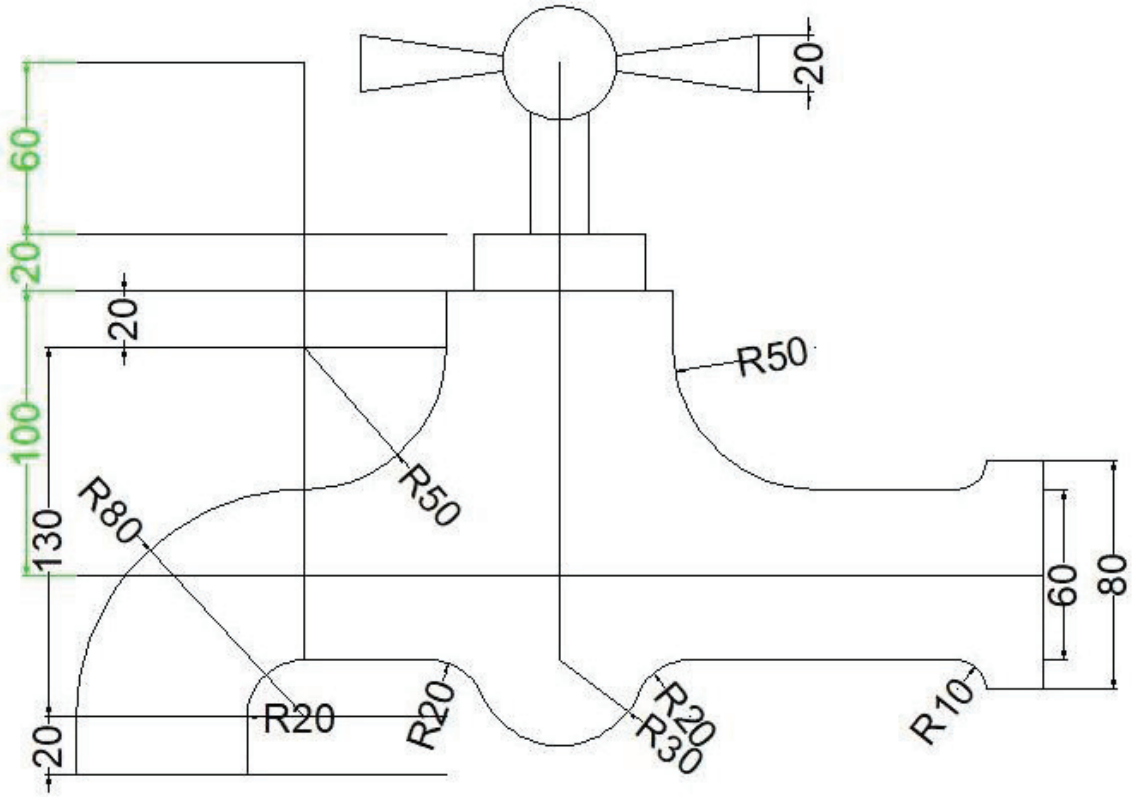
Step: 6

i. Create fillets.
ii. Firstly, set the radius of 50 mm in the fillet command.
iii. Create the fillet of this radius i.e. 50 mm to both sides of the body of knob.
iv. Set the radius of 80 mm in the fillet command.
v. Create the fillet of this radius i.e. 80 mm to the body to create bend to downwards.
vi. Set the radius of 20 mm in the fillet command.
vii. Create the fillet of this radius i.e. 20 mm to both the sides of threaded body to reduce the size of body.
viii. Create a circle of radius of 20 mm at bottom of centre line drawn vertically as shown in figure Step-6.



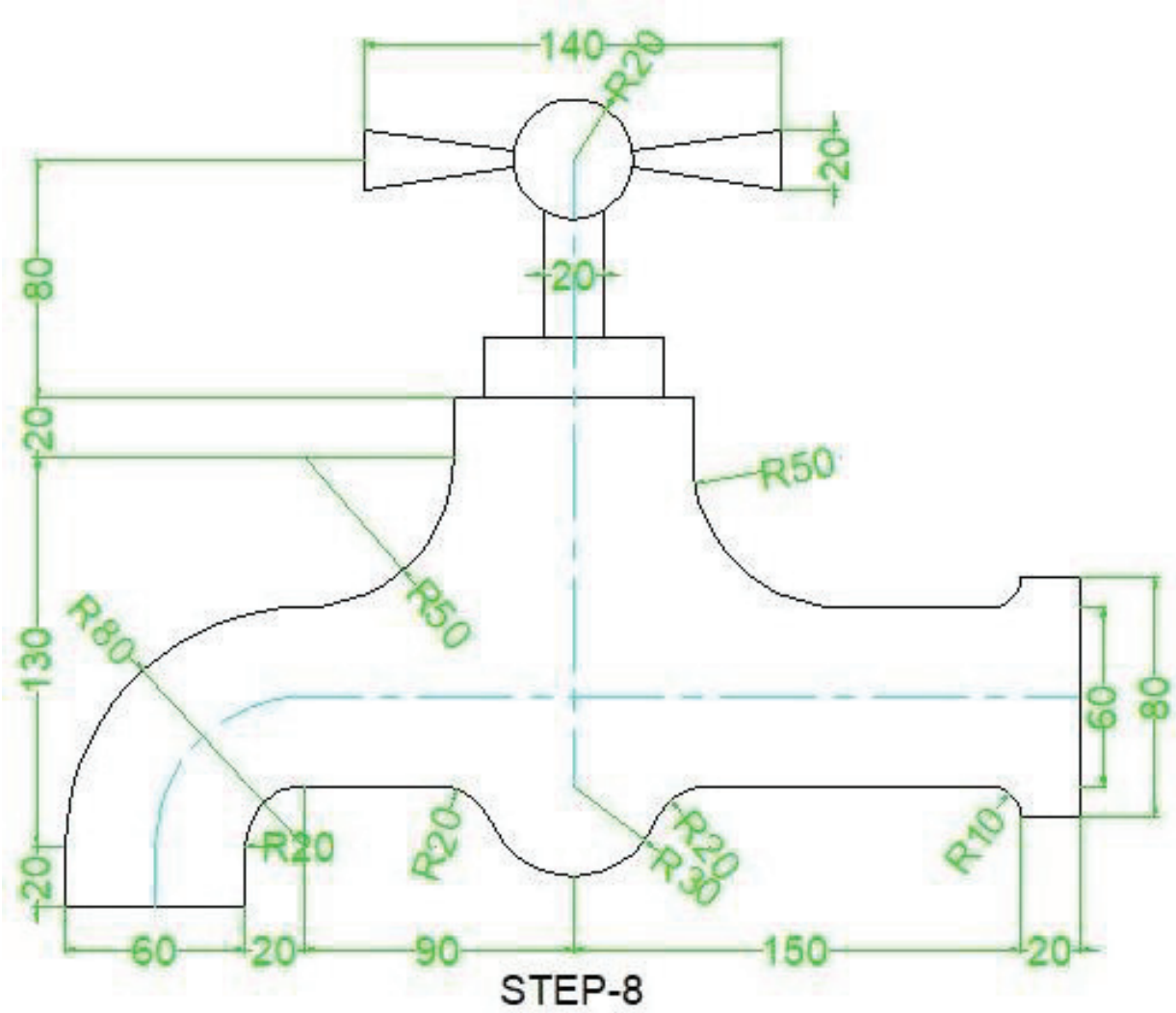
Step:7

- **i.** Trim the circle to from upper side.
- **ii.** Trim the horizontal body line passing through circle.
- **iii.** Set the radius of 20 mm in the fillet command.
- **iv.** Create the fillet of this radius i.e. 20 mm to both the sides of this semicircle obtained after trimming.
- **v.** Also create fillet for exit bend of tap.
- **vi.** Trim the horizontal and vertical extra lines to have the final shape of drawing.

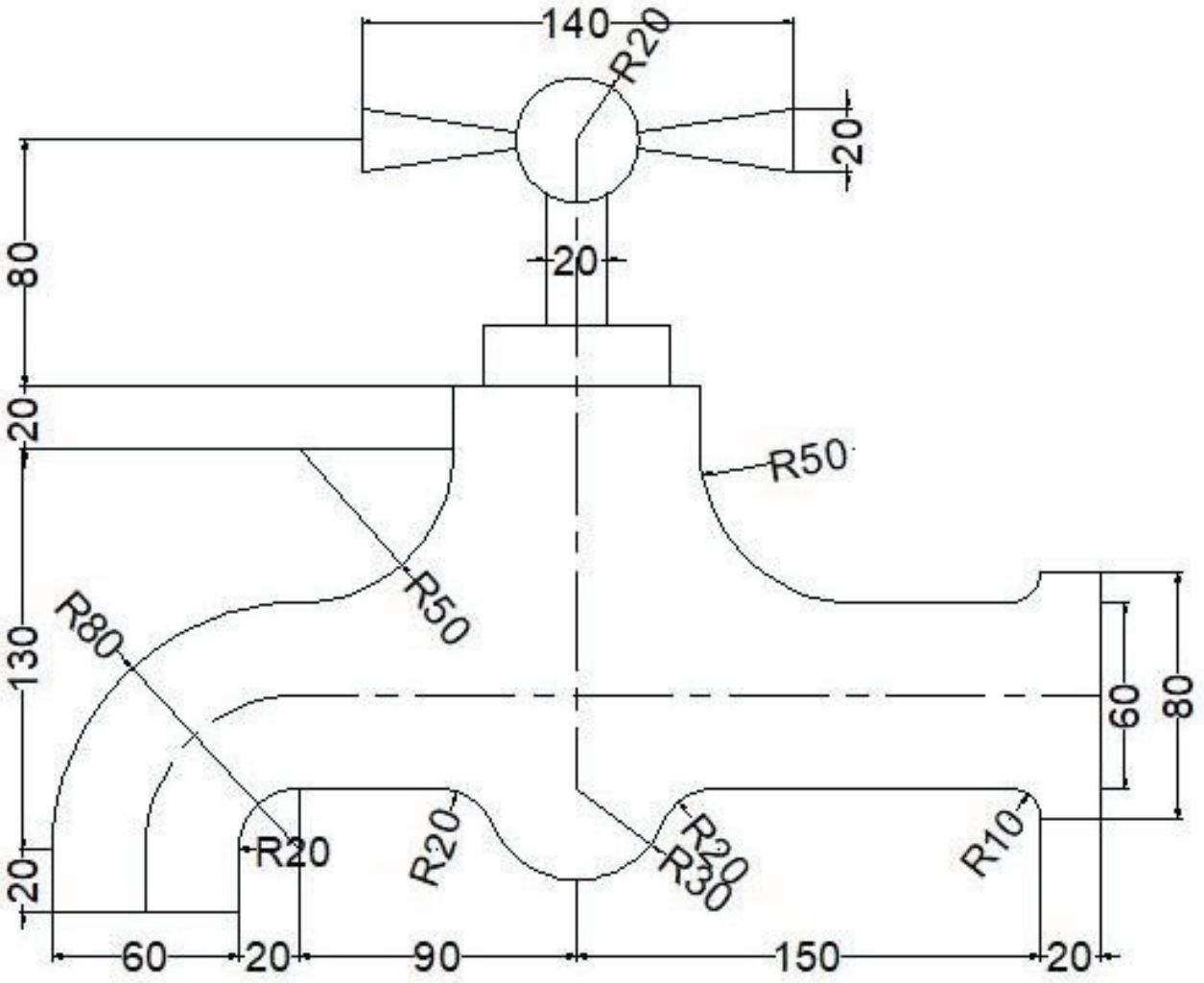


Step:8

- **i.** Using offset command for a distance of 30 mm create remaining portion of centre line.
- **ii.** Convert both the centre lines i.e. vertical and body centre lines from continuous to the symbol of centre line.
- **iii.** Format the dimension styles for 10 mm text height.
- **iv.** Draw linear dimensions individual and continuous dimensions for both the horizontal and vertical sides.
- **v.** Draw radius dimensions for all fillets (arcs).
- **vi.** The drawing will look exactly as shown in the figure Step-8 shown below.



STEP-8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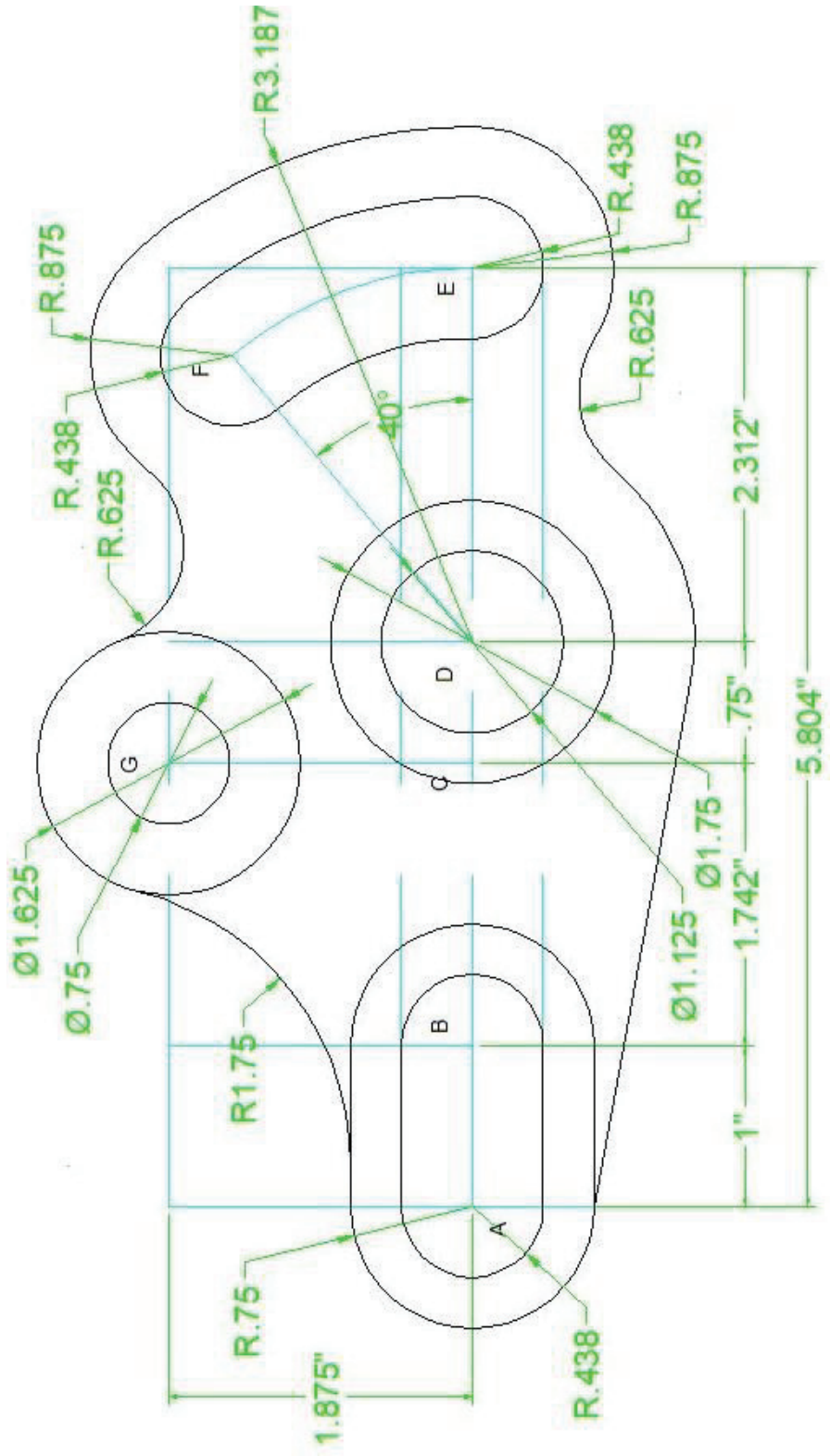
WATER TAP

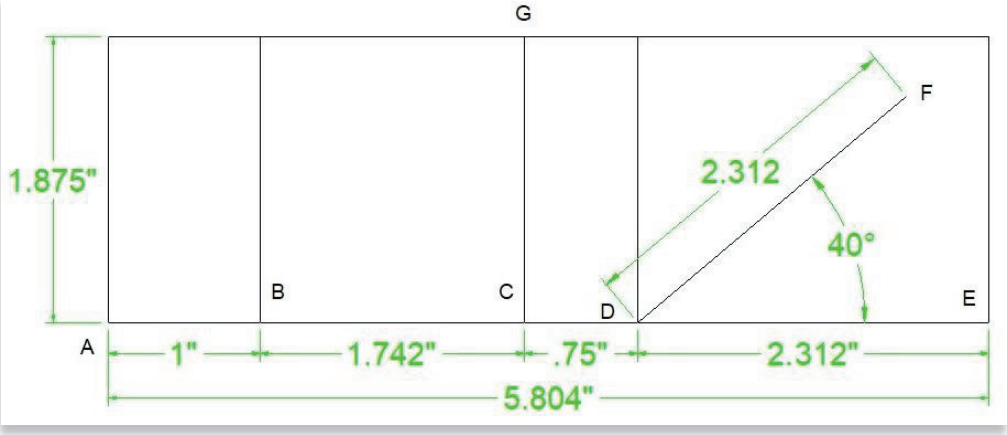
Practice-2

Part-b
Prepare the following object with its defined dimension.



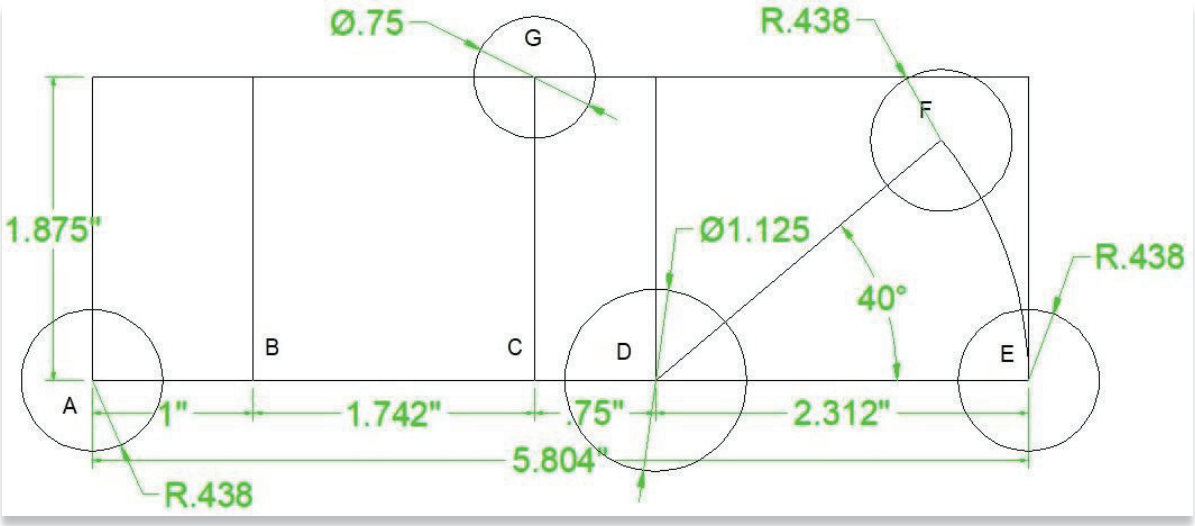
Step 1:

i. Open the template acad.dwt.
ii. Perform drafting settings i.e. format units to decimal with accuracy of0.000 inches.
iii. Create 3 text styles using arial fonts of text height 0.10-inch, 0.15 inch, & 0.2 inch.
iv. Create dimension styles for text height 0.1 inches with text suffix “, and 0.15 inches without suffix
v. Load line centre line and create layers i.e. Object 0.2 mm thick, centre line, text, dimension.
vi. Draw a line AE 5.804-inch-long horizontally taking its origin point coordinates 3, 5 inches.
vii. Draw a line 1.875-inch-long vertically up from the same coordinates.
viii. Now take off sets for vertical line to the right and for horizontal line to the upside as shown in the following figure step one:
ix. Draw a line DF 2.312 inch at an angle of inclination of 40 degrees from point



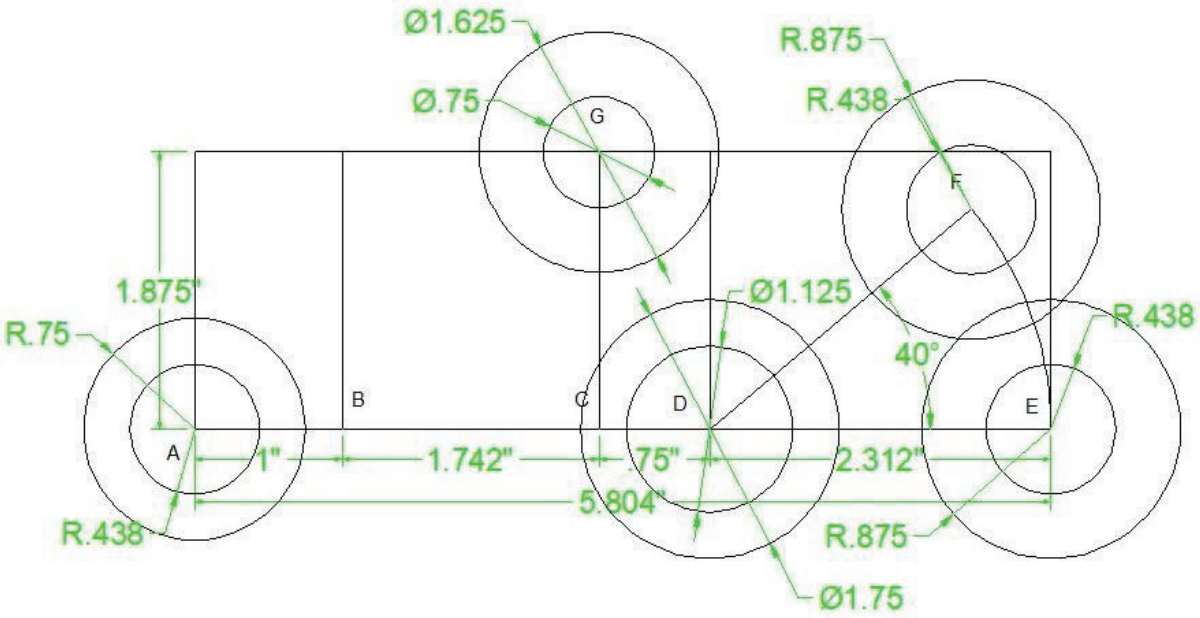
Step 2:

i. Draw circles of radius 0.4375 inch at points A, E, & F.
ii. Draw a circle of diameter 1.125 inch at point D.
iii. Draw a circle of diameter 0.75 inch at point D.



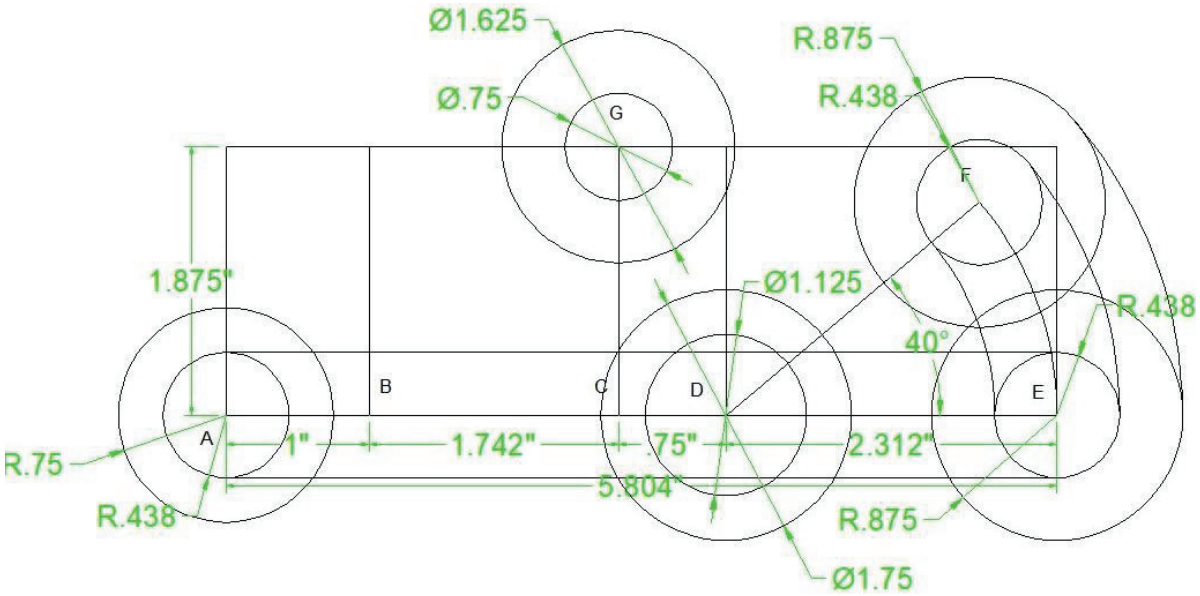
Step 3:

- **i.** Take the offset of 0.3125-inch to outside for circle at point A and D.
- **ii.** Take the offset of 0.3125-inch to outside for circle at point D.
- **iii.** Take the offset of 0.4375-inch to outside for circle at point E.
- **iv.** Take the offset of 0.4375-inch to outside for circle at point F.
- **v.** Take the offset of 0.4375-inch to outside for circle at point G.



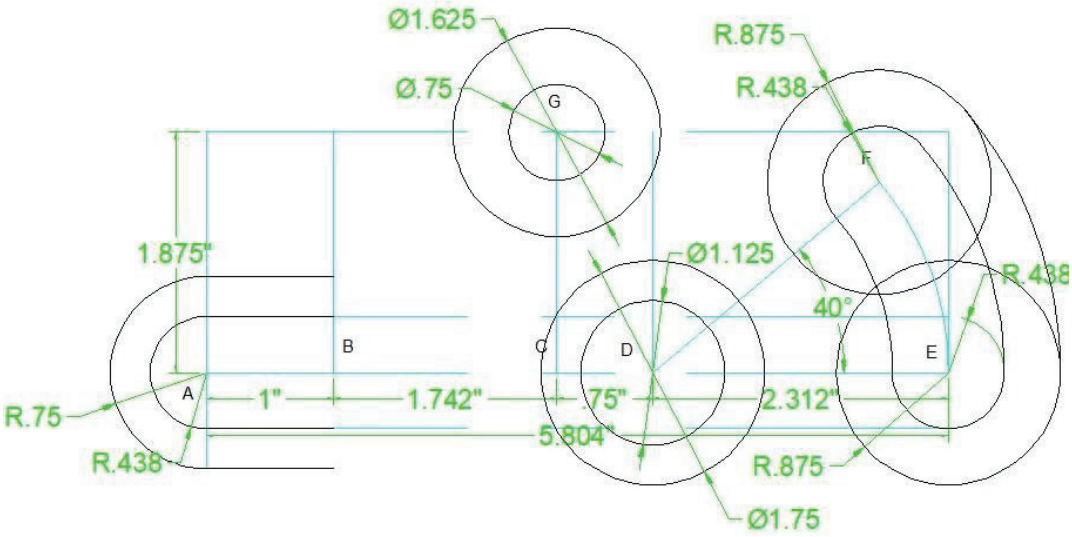
Step 4:

- **i.** Draw an arc starting from point E and ending at point F with centre at point D.
- **ii.** Take the offset of this arc for a distance of 0.4375 to inside.
- **iii.** Take the offset of this arc for a distance of 0.4375 on outside.
- **iv.** Take the offset of this arc for a distance of 0.4375 on outside.



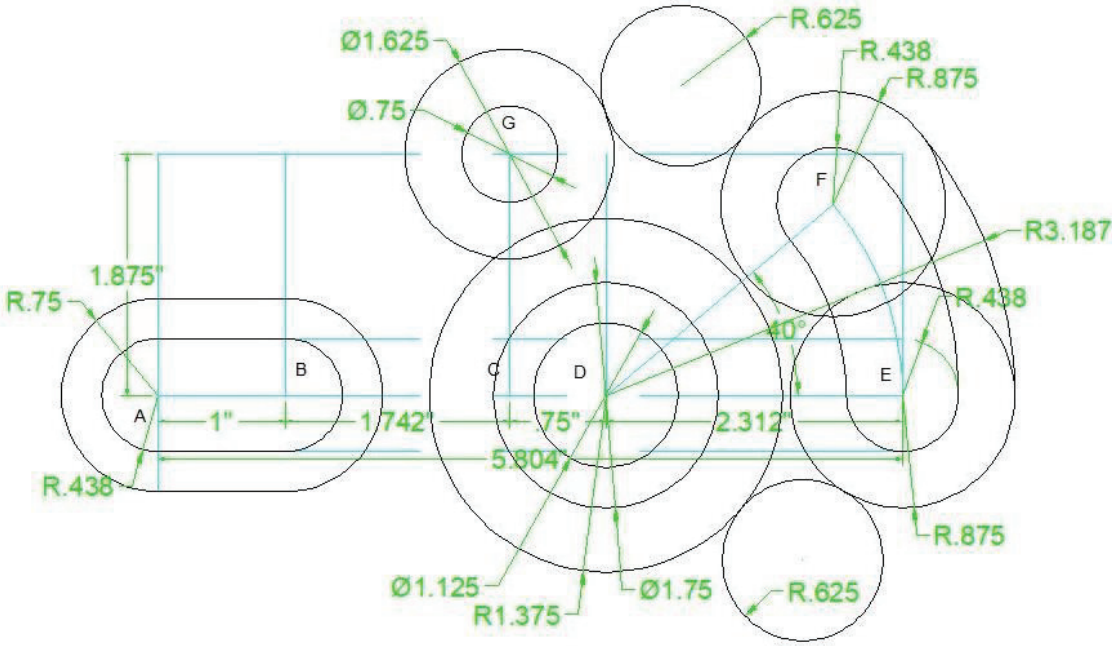
Step 5:

- **i.** Trim the inner circles on inner side at point E taking cutting edges of the arc meeting at its periphery.
- **ii.** Trim the inner circles on inner side at point F taking cutting edges of the arc meeting at its periphery.
- **iii.** Draw a line vertically at point A touching the circumference of outer circle.
- **iv.** Trim the right side of both circles at point A taking cutting edges of this vertical line.
- **v.** Draw lines of length= 1 inch to right side of these semicircles at point A.



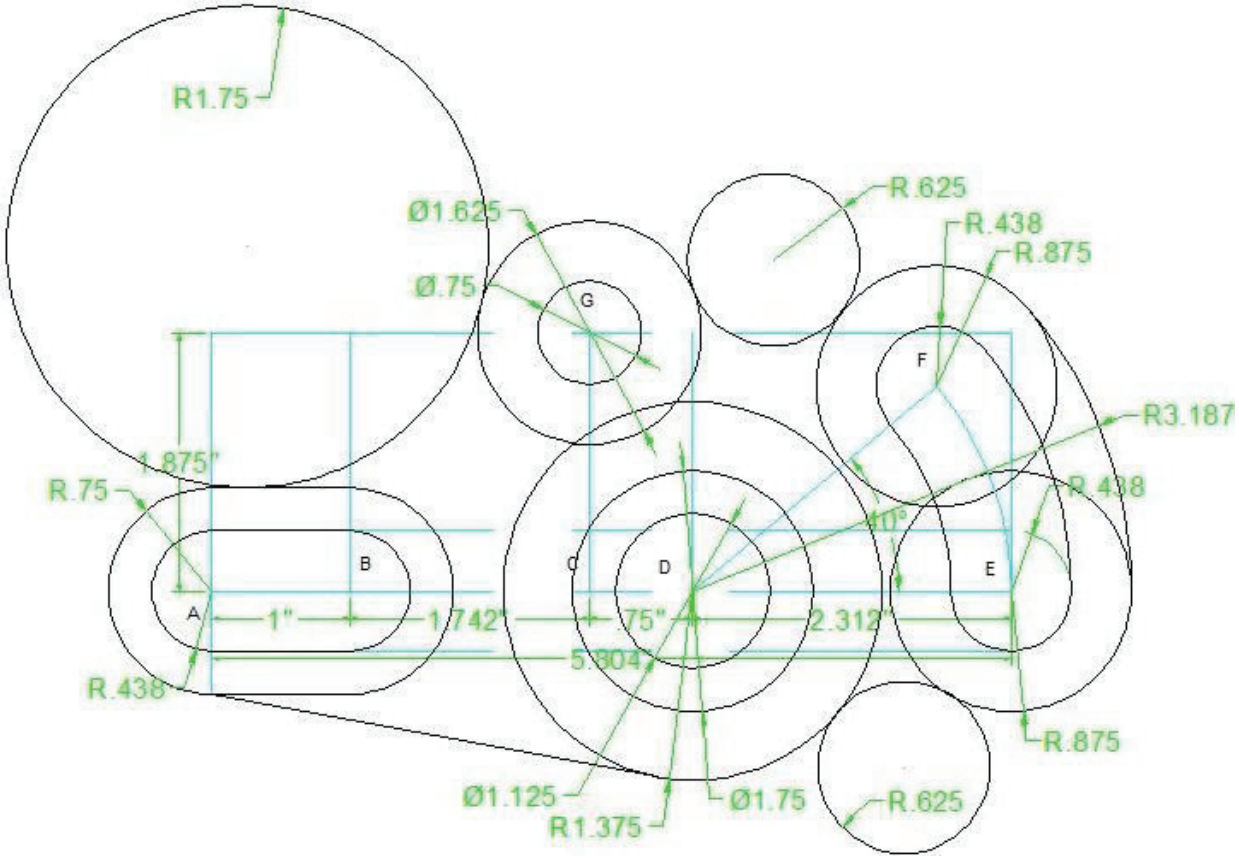
Step 6:

- **i.** Take the offset of 0.4375-inch to outside for bigger circle at point D.
- **ii.** Draw a circle of radius 0.625 with the TTR (tangent, tangent, radius command) having tangents the outer circle at point D and outer circle at point E.
- **iii.** Draw a circle of radius 0.625 with the TTR (tangent, tangent, radius command) having tangents the outer circle at point F and outer circle at point G.
- **iv.** Take the mirror of semi-circles at point A to right side having mid-point of 1 inch long lines as mirror axis.



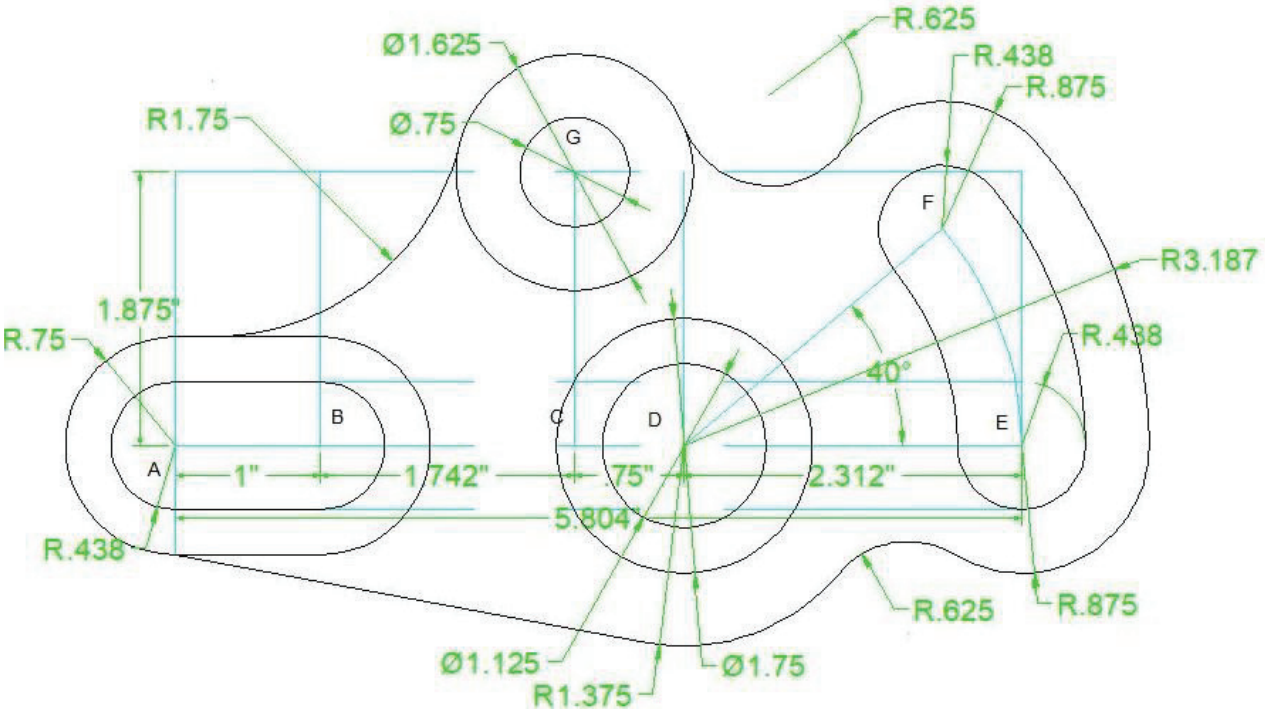
Step 7:

i. Draw a circle of radius 1.75 inches with the TTR (tangent, tangent, radius command) having tangents the outer circle at point G and top side horizontal line at point A.
ii. Draw a line starting from bottom quadrant point of outer circle at point A and becoming a tangent to the outer circle at point D**.**



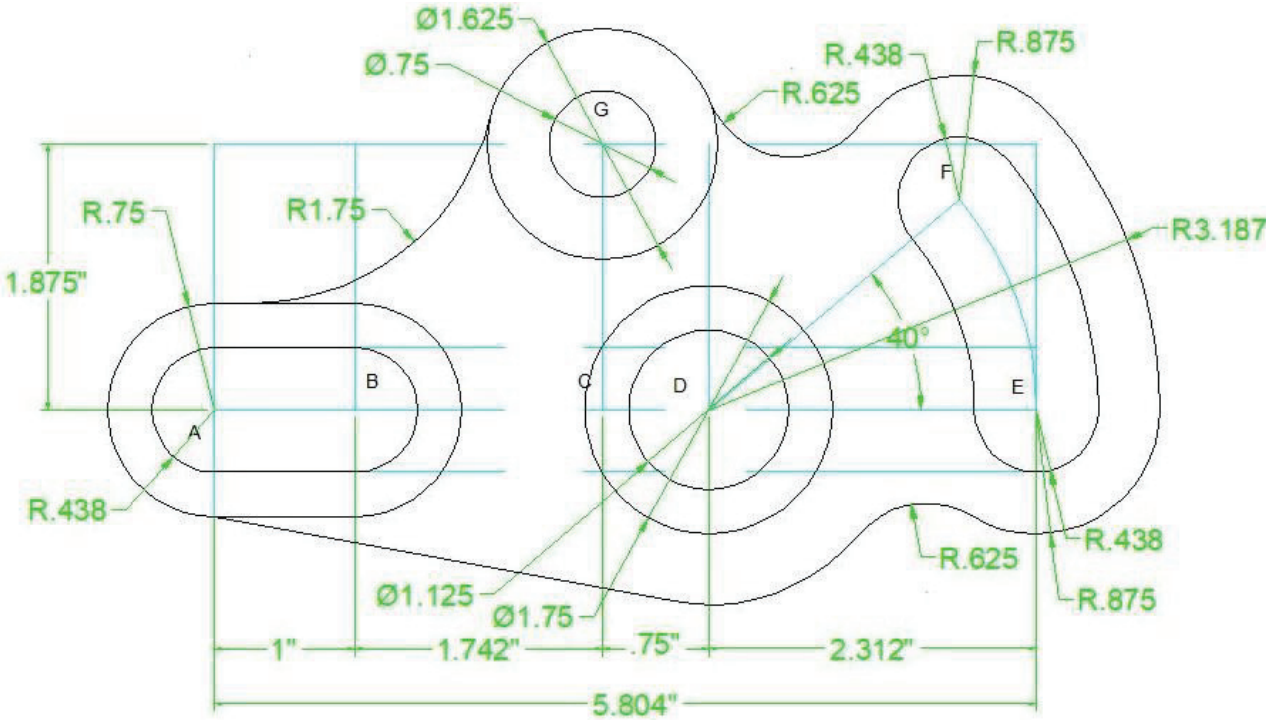
Step 8:

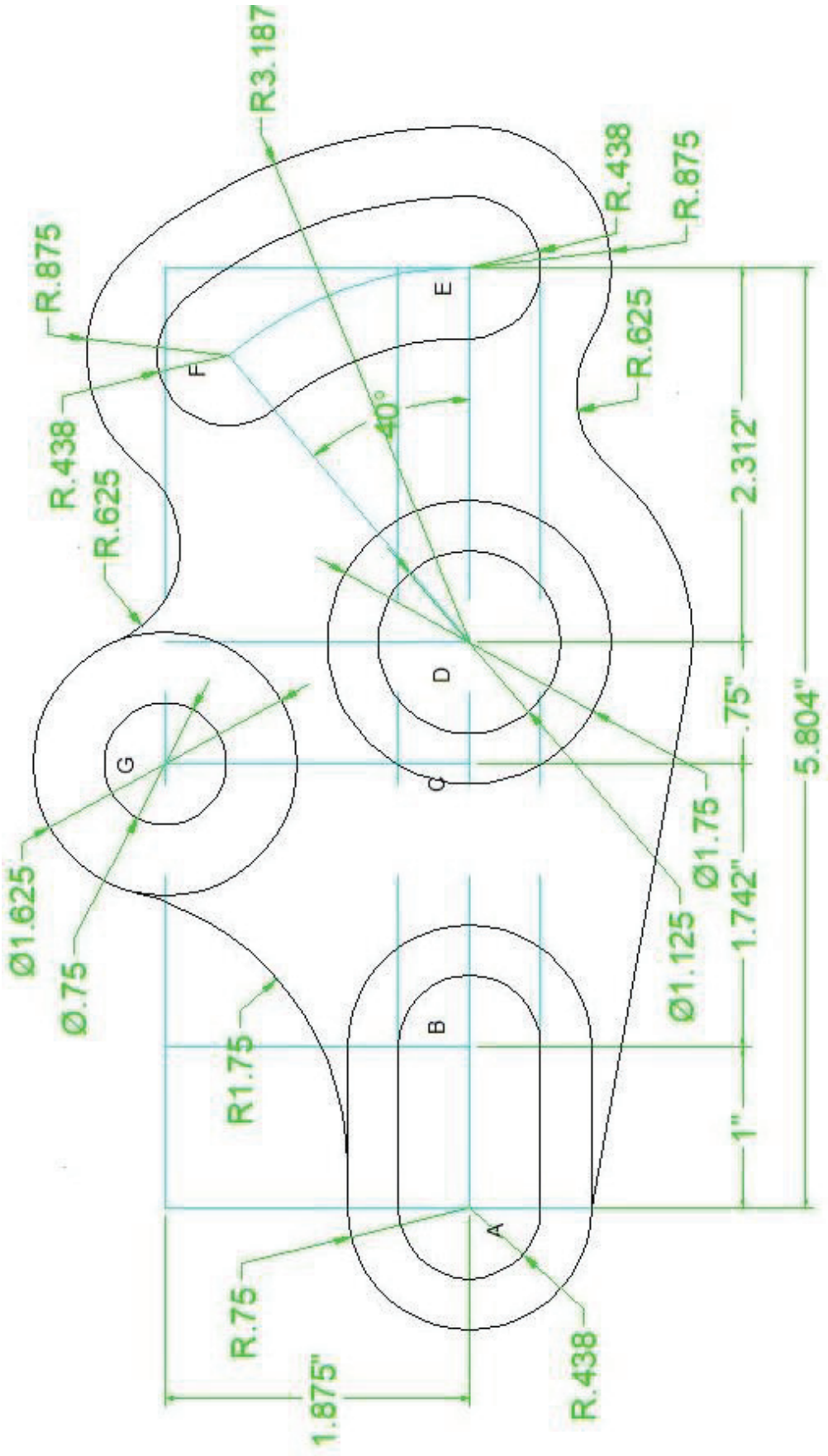
i. Trim the outer side of circle drawn by TTR command near point D and point E taking circumference of outer circle at point D and circumference of outer circle at point E.
ii. Trim the outer side of circle drawn by TTR command near point F and point G taking circumference of outer circle at point F and circumference of outer circle at point G.
iii. Trim the inner side of outer circle at point D taking cutting edges of inclined line & trimmed circle near point D & point E.
iv. Trim the inner side of outer circle at point E taking cutting edges of trimmed circle near point D & point E & outer arc at point E & point F.
v. Trim the inner side of outer circle at point F taking cutting edges of trimmed circle near point F & point G & outer arc at point E & point F.
vi. Trim the outer side of circle drawn by TTR command near point G and point A taking circumference of outer circle at point G and top horizontal line at point A.



Step 9:

- **i.** Use 10 mm dimension style to dimension the lengths, radii and diameters of elements.
- **ii.** Adjust the position of dimensions.
- **iii.** Set the thickness of object lines.
- **iv.** Assign the symbols to centre lines.




R3.187
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R.438
Ø1.125
Ø1.75
1.742"
1"
.75"
2.312"
5.804"
A
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C
D
E
F
G

Learning Unit 2:
Prepare final set of 2D the Drawings.

After completion of this Learning Unit you will be able to:

- ❖ Use appropriate commands and tools to develop 2D drawing
- ❖ Develop 2D drawing with given project specification and measurements.
- ❖ Create title block layout as required.
- ❖ Plot drawing on scale according to required size and orientation

2. Prepare final setup of 2D drawing

An architect or AutoCAD operator has to prepare different types of drawings. These may be submission drawings, working/ shop drawings, As Built Drawings and Structural drawings. These are described as under:

Submission Drawings
A Submission drawing or architectural drawing is a technical drawing of a building (or any project) that falls within the definition of Design or architecture Design. Submission drawings are used by architects, Site Engineers or Supervisors and others for a number of purposes: to develop a design idea into a coherent proposal, to communicate ideas and concepts, to convince clients of the merits of a design, to enable a contractor to construct it, as a record of the completed work, and to make a record of a building that already exists. Submission drawing is an act of submitting drawings (as for consideration or inspection) but still not approved,

Working Drawings
Drawing that is subject to clarifications but is complete with enough plan and section views (with dimensions, details, and notes) to enable the depicted item's construction or replication without additional information. Working drawing (shop drawings) is approved drawing and issued for construction for site.

Structural Drawing
A structural drawing, a type of Engineering drawing, is a plan or set of plans for how a building or other structure will be built. Structural drawings are generally prepared by registered professional structural engineers, and informed by architectural drawings. They are primarily concerned with the load-carrying members of a structure. They outline the size and types of materials to be used, as well as the general demands for connections. They do not address architectural details like surface finishes, partition walls, or mechanical systems. The structural drawings communicate the design of the building's structure to the building authority to review. They are also become part of the contract documents which guide contractors in detailing, fabricating, and installing parts of the structure.

Shop Drawings
A shop drawing is a drawing or set of drawings produced by the contractor, supplier, manufacturer, subcontractor, or fabricator. Shop drawings are typically required for prefabricated components.

As Built Drawings
Revised set of drawing submitted by a contractor upon completion of a project or a particular job. They reflect all changes made in the specifications and working drawings during the construction process, and show the exact dimensions, geometry, and location of all elements of the work completed under the contract. Also called record drawings or just as-builts.

2.1. Develop Drawing by using submission techniques

Different types of drawings are prepared at different stages. Submission drawings may be comprised of

i. Site Plan
ii. Propose Plan
iii. Detail drawing
iv. Foundation detail
v. Block Layouts of the plan
vi. Cross sections
vii. Elevations
viii. Schedule of Opening
ix. Schedule of Area
x. Detail of RCC (if any)

These are described as under:

2.1.1. Layout Plan

A map or a drawing of a construction site showing the position of roads, buildings or other constructions.

2.1.2. Landscape Plan

Landscape planning is a branch of landscape architecture. According to Erv Zube (1931–2002) landscape planning is defined as an activity concerned with reconciling competing land uses while protecting natural processes and significant cultural and natural resources.

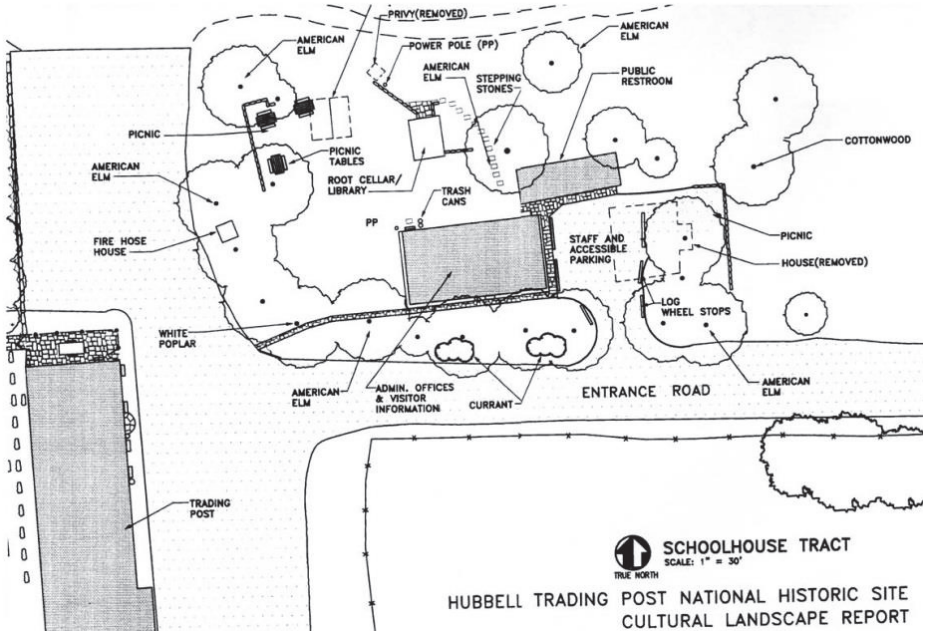


Fig Landscape plan

2.1.3. Site plan

A plan in which the outer shape of object is shown in relation to the direction or boundaries.

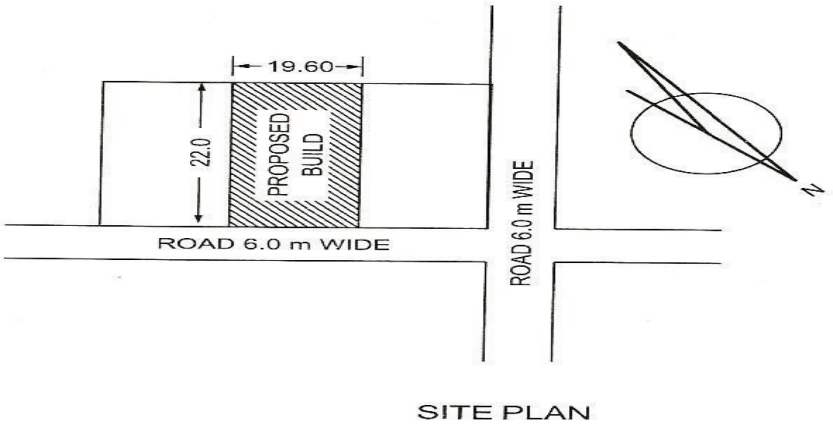


Fig Site plan

2.1.4. Line Plan

A plan drawn in a single line is called line plan.

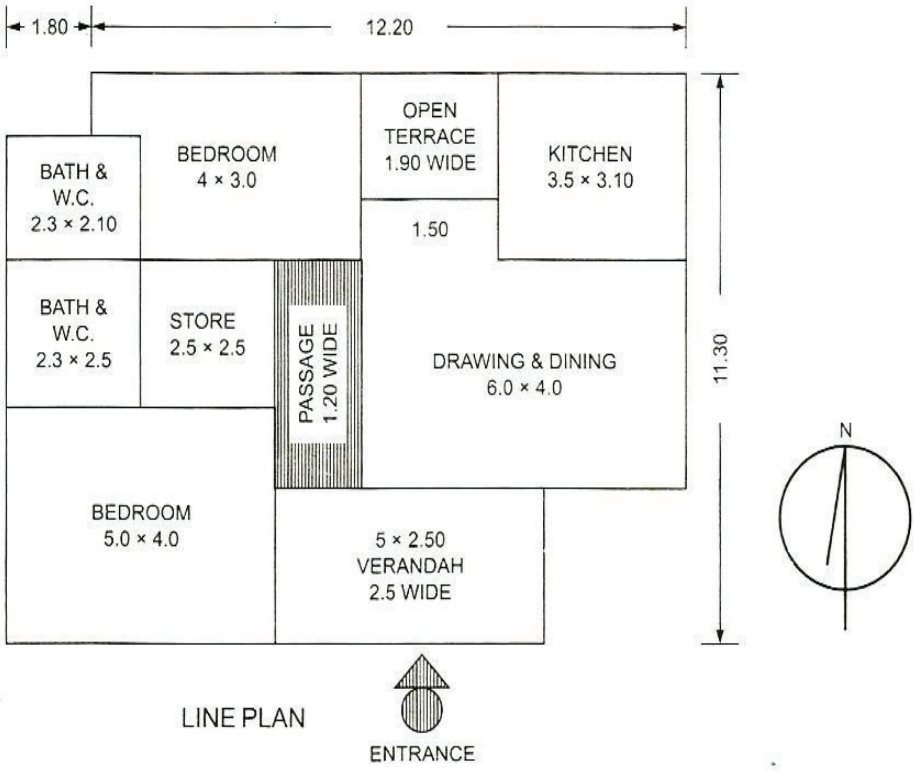
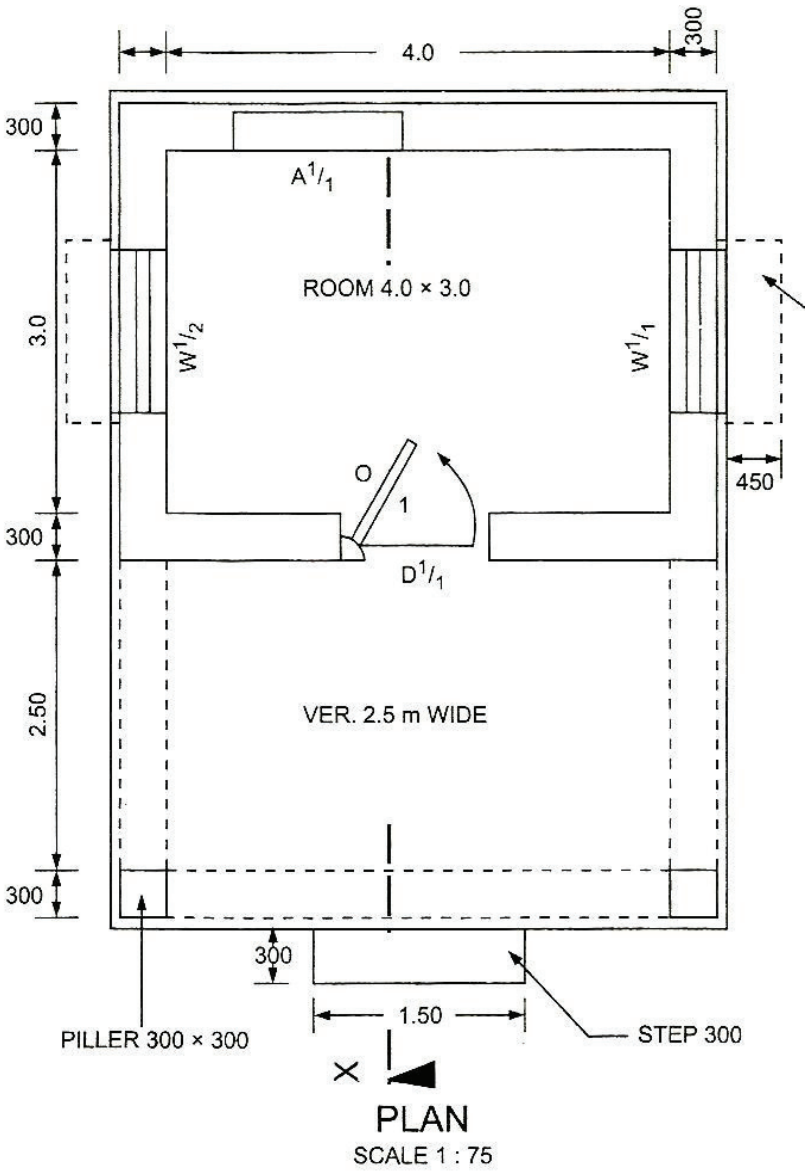


Fig Line Plan of Building

2.1.5. Detailed Plan.

The single line plan is developed into a double line or solid plan. Length and width of rooms are shown in the plan. Plan is drawn by assuming the structure to be cut at a height of 1.5m from ground level. Thickness of walls, width of doors, windows, sun shades, steps and porches etc. are shown in the plan. The parts of structure above the cutting plane are shown by dotted lines. Plinth projection is also shown in the plan.


4.0
300
300
A 1/1
ROOM 4.0 × 3.0
3.0
W 1/2
W 1/1
O
1
450
300
D 1/1
2.50
VER. 2.5 m WIDE
300
300
1.50
PILLER 300 × 300
STEP 300
PLAN
SCALE 1 : 75

2.1.6. Foundation Plan.

A horizontal plan taken below the plinth level and drawn on horizontal plan.

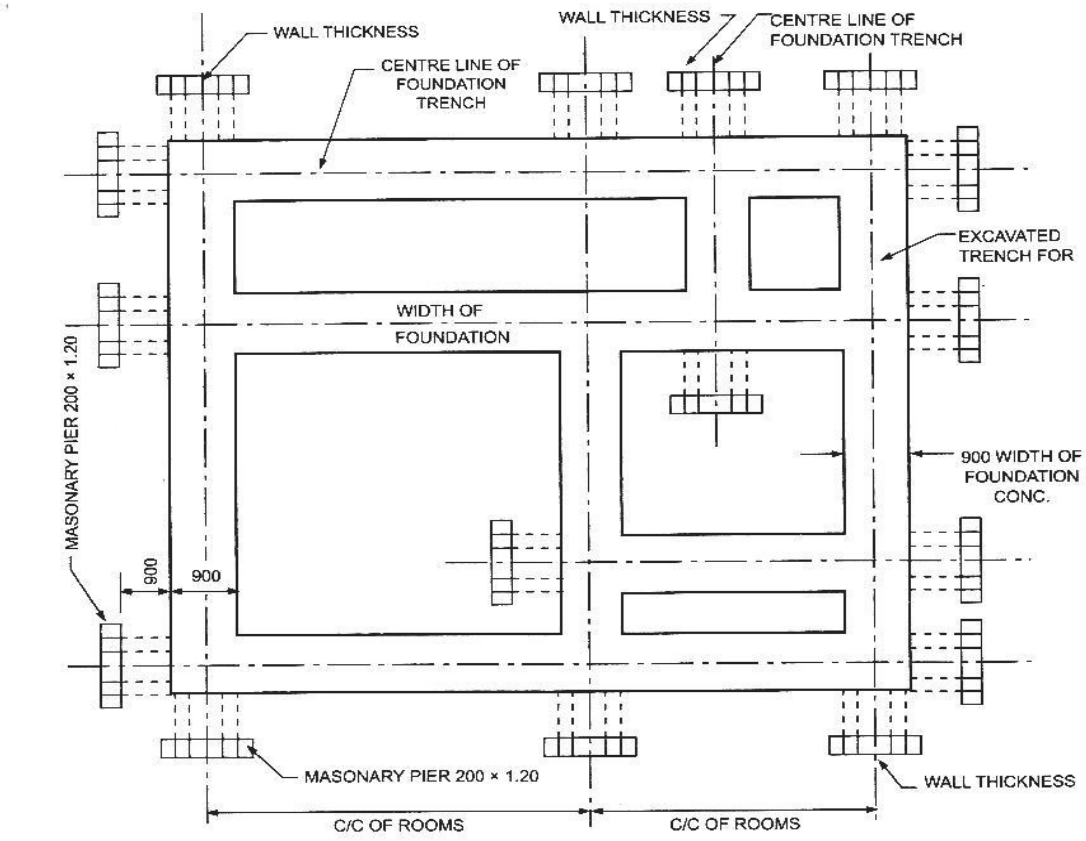


Fig Foundation Plan

2.1.7. Location Plan

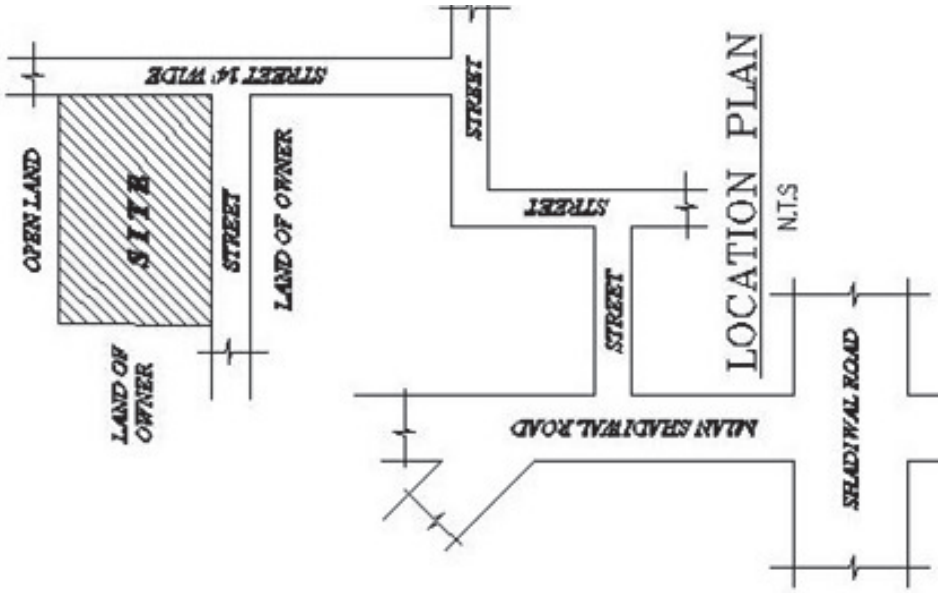
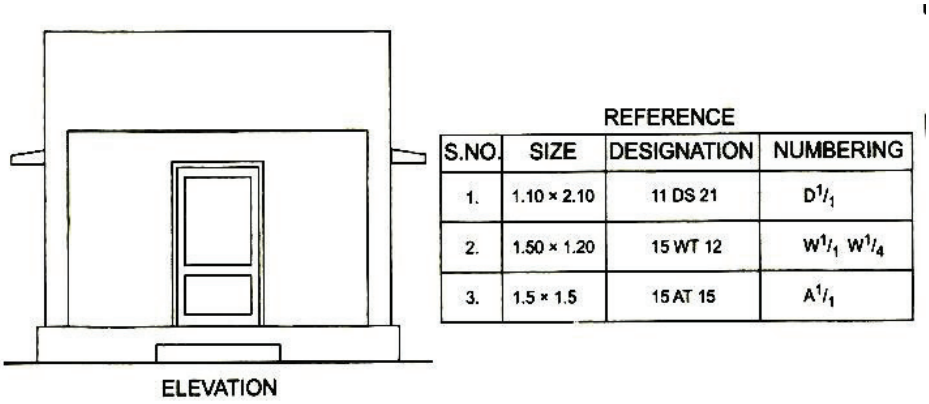


Fig Location Plan

2.1.8. Elevation

It shows the width and height of a structure. Front and side views are drawn to give frontal and side look of the structures. The shape of windows, doors, verandah openings, sun shade, Louvers, railings and parapets are shown in their true look.



REFERENCE

S.NO.	SIZE	DESIGNATION	NUMBERING
1.	1.10 × 2.10	11 DS 21	$D^1/_1$
2.	1.50 × 1.20	15 WT 12	$W^1/_1$ $W^1/_4$
3.	1.5 × 1.5	15 AT 15	$A^1/_1$

Fig Elevation

2.1.9. Section

The structure is supposed to be cut by a vertical plane, and the view of cut-section is drawn, which is termed as a section. It shows height of rooms and depth of foundations, type of roofs, floors, thickness of walls and plinth height etc. Section also shows type of materials used for construction. Different conventional symbols are used to show different materials. Height of doors, windows and Almirah's including thickness of lintels are also shown in the structure.

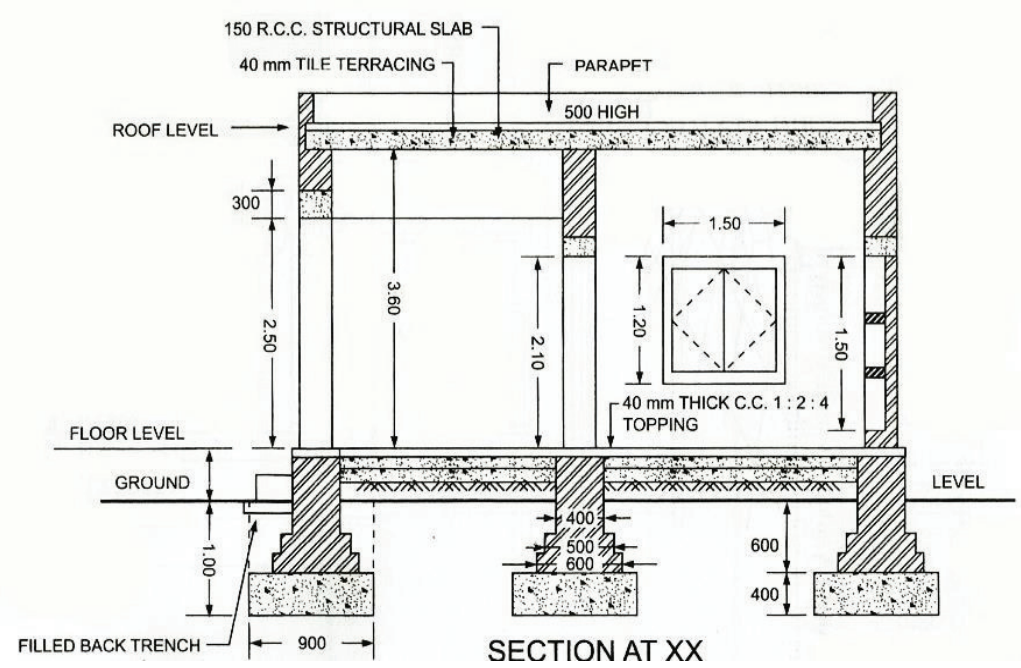


Fig Section

2.2. Guidance on the Submission of Planning Applications

Please send electronic attachments (in addition to any paper copies) on CD/DVD wherever possible.

2.2.1. Plans and drawings

Submit plans with a clearly identified scale where measurement is a consideration of the plans' contents.

Both the scale and the native size of the plan should be identified e.g. 1:2,500@A3.

A scale bar must be included on all plans/drawings.

Do not use the words "do not scale from drawings".

If accurate measurements cannot be determined then the application will be deemed invalid and returned for correction.

Submit plans which are dated, have titles clearly describing the subject matter and reference numbers which are sequential and clearly indicate the revision version where appropriate.

2.2.1.1. Layout Plan:

This is a plan of the whole of the property, ie, the house, all detached buildings, garden, other open areas and the position/spread of all trees.
All of the boundaries of the property should be shown, together with the exact position of any proposed detached building or extension.
The suggested scale is 1:200 or 1:500.

2.2.1.2. Floor Plan(s):

It is often possible to combine the layout and floor plan.
It is particularly important to make the existing and proposed floor plans two separate drawings if any demolition is involved.
The suggested scale is either 1:50 or 1:100.
If the proposed building is sited on a boundary please state whether or not there will be any encroachment (eg foundations) onto the adjoining boundary.
The plans need to show both the existing and the proposed floor plan.

2.2.1.3. Elevations:

This is the term used to describe a drawing of what the building will look like from the outside.
If the proposal is to extend the house or erect a building close by, every
elevation should normally be included (preferably to the same scale as the floor plans); the whole of the existing house must be shown so that
the relationship of the new building to the original house can be clearly
seen.
Drawings of both the existing and proposed elevations are required.

If any boundary walls or fences are proposed then elevation details are required. This is also required on the layout plan.
Where existing and proposed are shown on the same plan the proposed works should be clearly highlighted.

The use of the rooms and buildings proposed must be clearly indicated on the plans.
Where the proposal effects parking within the site (eg, the conversion of
a garage) then the available parking areas should be clearly identified on the plans.
Where you are proposing roof terraces or balconies, you must identify them on all drawings, showing any safety walls or railings.

2.2.1.4. General

Submit documents which display valid copyright messages (e.g. Ordnance Survey map copyright) wherever appropriate and which are not copy protected.

Submit text documents with logically referenced and headed sections rather than bullet points or unnumbered paragraphs, so that individual sections within the document can be easily referred to (e.g. ‘section 1.1.1’ etc).

Please note that all documents you submit form part of a public register and as such these documents are available on our website

2.2.1.5. File Structure

Provide diagrams that are clearly annotated and include a drawing key where appropriate to explain the use of different shading, edging and symbols.

Provide drawings that include a scale bar and at least one key dimension.

Applications will be invalidated if they do not include this information.

Provide drawings that contain a compass point marker (showing N) where appropriate.

2.3. Building Bye-Laws

To safe guard the residential property against external forces, governing bodies of societies have developed certain laws which must be observed during the construction for health and other environmental facts. These are known as building bye-laws.

2.3.1. Building permit

Every person who intends to erect or re-erect a building or intends to make additions and alternations in an existing building shall apply to the authority in prescribed form with prescribed fees, together with plans in Ferro prints and statements in triplicate.

2.3.2. Plans

Plan shall consist of the followings: -

i. Site plan drawn to a scale not less than 8m = 1cm (64'=1") showing boundaries of the site adjacent streets, etc., and north direction.

ii. Building plans, elevations and sections drawn to a scale not less than 1m=1cm (8'=1") and all new constructions shall be colored red. Drainage and sewer lines shall be shown red dotted lines. Work proposed to be dismantled shall be shown in yellow color. Location of W.C., sink, drains, etc., shall be shown clearly. Sectional drawings shall show the size of footings, walls roof, slab beams, etc. All plans shall be signed by the owner and by a qualified architect or engineer.

2.3.3. Size of rooms—

Drawing room	Standard type	Ordinary type
Drawing room	…4.2 × 4.8m to 5.4 × 7.2m (14' × 16 to 18' × 24')	4.2 × 4.8m (14' × 16')
Dining room	…4.2 × 4.8m to 4.8 × 6.0m (14' × 16 to 16' × 20')	Combined drawing and dining room
Bed room	…4.2 × 4.8m (14' × 16')	3.0 × 4.2m (10' × 14')
Office room	…3.0 × 3.6m (10' × 12')	—
Kitchen	…3.0 × 3.0m (10' × 10')	2.5 × 3.0 (8' × 10
Store	…3.0 × 3.0m (10' × 10')	2.5 × 2.5m (8' × 8')
Pantry	…2.5 × 3.0m (8' × 10')	—
Dressing	…2.5 × 3.0m (8' × 10')	—
Bath and W.C.	…1.8 × 2.5m (6' × 8')	1.8 × 1.8m (6' × 6')
Latrine	… —	1.2 × 1.2m (4' × 4')

Bath	… —	1.2 × 1.8m (4’ × 6’)
Box room	…1.8 × 1.8m (6’ × 6’)	—
Verandah	…2.5 × 3.0m wide (8’ to 10’ wide)	1.8 t 2.5m (6’ to 8’ wide)
Garage	…3.0 × 6.0m (10’ × 20’)	—
Servant’s room	…3.0 × 3.0m (10’ × 10’)	—
Height of main rooms	…3.6 to 4.8m (12’ to 16’)	3.6m(12’)
Height of other rooms	…3.0m (10’)	2.7 to 3.0m (9’ to 10’)

2.3.4. Minimum floor area of rooms and heights—

Drawing room	Standard type	Ordinary type
Living	…10sq m (100 sq ft) (breadth min. 2.7m or 9’)	…3.3m (11’)
Kitchen	…6sq m (60 sq ft)	…3.0m (10’)
Bath	…2sq m (20 sq ft)	…2.7m (9’)
Latrine	…1.6sq m (16 sq ft)	…2.7m (9’)
Bath and W.C. combined	…3.6sq m (36 sq ft)	…2.7m (9’)
Servant’s room	…10.0sq m (100 sq ft)	…3.0m (10’)
Garage	…2.5 × 4.8 m (8’ × 16’)	…3.0m (10’)
Minimum height of plinth for main building		…0.6m (2’)
Minimum height of plinth for Servant’s Quarters		…0.3m (1’)
Minimum depth of foundation		…0.9m (3’)
Thickness of wall — 20cm to 30cm (9” to 13½”)		
D.P.C 2cm to 2.5cm (¾” to 1”) thick — full width of plinth wall		

2.3.5. Method of placing rooms of a residential building w.r.t the direction of the sun

The method of placing rooms of a residential building w.r.t the direction of the sun is being illustrated in Fig. Drawing or living rooms should be placed in SE and W; dining rooms in SE and SW; Verandahs in South and West, Kitchen in NE and SE; Stairs and stores in NW and NE as shown

in the figure. The position of the Kitchen should not create smoke nuisance in other rooms of the building. The drawing room may face towards west or southwest but should be protected by a verandah. In the absence of a verandah, sun breakers, consisting of thin R.C.C. slabs, are provided horizontally or vertically.

MINIMUM AREA OF THE OPENINGS FOR VENTILATION OF SPECIFIC ROOMS

Ventilation consists of an inlet of fresh air and exit of vitiated or stagnant air, and maintaining a movement of air in the rooms and the building.

For proper ventilation windows and ventilates should be provided to the requisite numbers, opening directly into external air or into open verandah. For proper ventilation windows should have minimum area of 1/8 of the floor area of the room and the aggregate area of the doors and windows should not be less than ¼ of the floor area of the room. Windows should be provided 60 to 90cm above floor level. In addition to the doors and windows ventilators should be provided having a total area of 4 percent of floor area. Ventilators serve as good exit for inside air and should be provided as near to the ceiling as possible within 60cm from the ceiling. The area of each ventilator should not be less than 1 sq. Meter.

In living room at least two windows should be provided one in each of the opposite walls, if that is not possible there should be at least two windows one in each of the adjoining walls, bathrooms, toilet and kitchens should have at least one window of 0.9×0.12m size

Area of windows for proper ventilation of rooms may be calculated for various formulae:-

i. $A = \sqrt{B \times L \times H}$ **ii.** $\frac{B \times L \times H}{100}$ **iii.** $\frac{B \times L}{8}$

Where A = total clear opening of window
L = length of room
B = breathe of room and H = Height of Room

The relation between height (h) and width (w) of window may be taken as w = 0.7h, though this may vary according to the requirement and aesthetic point of view.

2.3.6. POSITION OF DIFFERENT OPENINGS

To have the best living atmosphere, there should be provision of openings for ventilation of buildings. The proper availability in rooms for passage of air and light opening must be provided at proper locations. These opening may be doors, windows, ventilators etc.

2.3.6.1. Position of doors

Doors should be located in such a way that free movement in and out of the rooms of a building is ensured. To fulfill this object and other purposes of providing doors in a building, the following factors should be considered while deciding the location of doors in a building.

i. Doors should preferably be located at a distance of about 20cm from the corner of a room.

ii. Doors should be preferably be located in the opposite walls in case the room is to be provided with more than one door so as to have a good ventilation in the room.

Doors should be located keeping in view also the interior decoration of the room.

2.3.6.2. Size of doors

Location	Size
Drawing rooms, bed room	1200 × 2100mm (1.2m × 2.1m)
Stores	1000 × 2100mm (1.0m × 2.1m)
Kitchen, bathrooms	900 × 1900mm (0.9m × 1.9m)

2.3.6.3. Position of Windows

Windows located on north side would be highly effective. The following factors should be considered while deciding the location of windows in a building:

i. Windows should be located opposite to each other or opposite to door, wherever possible.

ii. The sill of windows should preferably be placed at a height of 80cm from the floor level. In residential buildings situated just near public places like cinema halls, shopping centers or where the privacy of rooms on the ground floor is necessary, sill of the windows should be placed at higher level, which may be about 2m above ground level.

Windows should be located in such a way that they should fulfill the requirements of distribution of light, control of ventilation, privacy etc.

Sizes of windows Location	Size
Living room of common residential building	1200 × 1400mm (1.2m × 2.1m)
Kitchen, stores	900 × 1400mm (0.9m × 1.4m)

2.3.6.4. Position of ventilators

The ventilators provided in a wall under the roof but above the adjoining verandah of a room are called clerestory windows or C-windows.

When there is not adjoining verandah, the arrangements made near the roof level for natural ventilation and entrance of light in a room are called ventilators. The leaf of a ventilator is fixed to the sides by swinging it on two horizontal pivots so that it can be opened or closed by means of cords as shown.

- **Size of ventilator**
  a) 1800 × 600mm
     (1.8m × 0.6m)
  b) 900 × 600mm
     (0.9m × 0.6m)

2.3.6.5. Material used in construction

The following materials are used in construction of buildings:

i. Stones

ii. Bricks and other clay products such as floor tiles, roofing tiles.

iii. Cement such as Portland cement, white cement, colored cement.

iv. Lime

v. Aggregates in the form of broken brick, crushed stone, gravel, sand, surkhi, etc.

vi. Timber and timber products such as plywood, hard board, batten board etc.

vii. Metals in the forms of rolled steel sections, mild steel and tensile steel.

viii. Paints, varnishes and washes etc.

ix. Glass in various forms

x. Plastic materials / sheet

xi. Insulating materials

xii. Bituminous materials as asphalt

xiii. Door and window fittings

xiv. Earth / Mud / Clay

xv. Water

2.3.7. Minimum Area of the building services

Sr. No.	Name of the Room	Area of floor in standard building in m²	Area of floor in ordinary house in m²	Minimum area in m²
1.	Bed room	15 — 25	20	12
2.	Dining room	15 — 25	Drawing room may be used for the purpose	13.5
3.	Drawing room	20 — 30	20	10.0
4.	Guest room	9 — 10.5	—	7.0
5.	Office room	7 — 9	—	6.50
6.	Dressing room	4 — 7	—	5.0
7.	Box room	5 — 7	—	4.0
8.	Kitchen	7 — 9	7 — 8	5.5
9.	Pantry	5.5 — 7.0	—	4.5
10.	Store	7.0 — 9.0	5.5 — 6.0	5.5
11.	Attached bath and W.C. combined	4.5	——	2.80
12.	Bath	—	2.5 – 3.5	1.80
13.	W.C.	—	1.2 — 1.5	1.10
14.	Servant room	9 — 10	—	9
15.	Garage	15 — 18	—	11
16.	Verandah	2.5 — 3.0 wide	1.8 — 2.5m wide	1.5m wide

According to building Bye Laws minimum heights of various rooms should be as follows:

Height of the rooms	= 2.75m
Height of the kitchen	= 2.75m
Servant quarter	= 2.40m
Store, Bath and W.C.	= 2.40m

2.3.8. Height / Thickness of the Plinth

For important buildings	= 6.0cm
For ordinary buildings	= 3.0cm

Level of inside courtyard and garage above the level of road in front of the building, should be minimum 15cm.

2.3.9. Shape of Plan for the Building

As far as possible, plan of the building should be kept square instead of rectangular. Length of the walls in case of square plan is about 15 to 20% less than that in case of rectangular plane. For example let there be two plans of same area. One is 8m × 8m and other is 16m × 4m. Lengths of perimeter in case of square plan is 32m, where as it is 40m in case of rectangular plan.

2.3.10. Correct Area of the Building

Building plots may be classified according to area as follows:

A type plots	—	1000m² and above
B type plots	—	750m² and above
C type plots	—	500m² and above
D type plots	—	225m² and above

The sizes of plots given above are not standard ones and the size may vary according to economic conditions of the people.

Roughly, minimum size of residential plot should not be less than 150m² and maximum not greater than 1600m².

2.4. Create Title Block/ Title Strip Layout as required

The provision of a blank border will enable prints to be trimmed, if necessary with incurring the use of uneconomical sizes of sensitized material to allow for trimming. The title block is an important feature in a drawing, since it facilitates obtaining uniformity and present details like title of drawing, name of firm, drawing number, scale, date of drawing etc. in a definite manner. It is recommended that the title block should have space for the following information: -

i. Name of the project or description or title of drawing.
ii. Drawing number.
iii. Scale.
iv. Symbol denoting the method of projection.
v. Name of office/firm and Ref. No.
vi. Dated initials of staff designing, preparing tracing and comparing the drawing, checking of accuracy and checking for standards.
vii. Signatures of officers approving the design.

- Where appropriate, additional information and notes may be included as follows: -

i. Job order number.
ii. Material or part list.
iii. Treatment, finish, etc.
iv. Key to machining and other symbols and legends.
v. Tolerance on dimensions.
vi. Tool, gauge, jig and fixture references.

The items in the title should be lettered in accordance with their relative importance. Some companies adopt standard title form and have them printed in standard sheets of tracing cloth or paper, so that the draftsman required merely filling in the blank spaces.

Following figure shows a Title Block for class work. It should include the following: -

i. Heading or title of drawing
ii. Scale
iii. Date
iv. Name of institution
v. Name of city
vi. Sheet No.
vii. Name of student
viii. Class with branch
ix. Roll No.

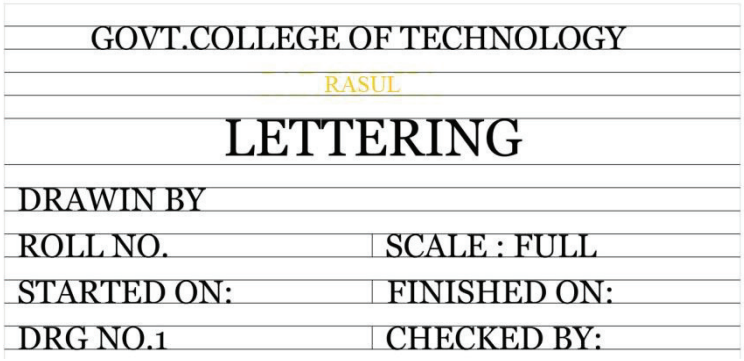


Fig. Title Block

A Title block with other annotations e.g. Specifications, Schedule of Areas, Schedule of Openings may be as under

SUBMISSION DRAWING Plot No._____ Block: _____		
Specifications Detail of specifications		
Schedule of Area		
Schedule of Openings		
Proposed Plan of House Plot No. , Street: _____ Colony Name: _____, Town_____, Tehsil & District Names. Owner Name: _____ S/O _____		
Submitted by: Signatures: _____ Name: _____ Dated: _____		
Prepared by Architect: Signatures & Stamp: _____		
Submission by T.M. A. Approved Architect: Signatures & Stamp: _____		
Approved By: Society Name: _____ Signatures & Stamp: _____ Engineer		
Drawn by Draftsman	Checked by Engineer	Revision/ Issue No.: _____

SUBMISSION DRAWING SPECIFICATIONS

1– FOUNDATION:– (1:2:4) R.C.C RAFT FOUNDATION. OVER 3" P.C.C(1:3:6)
2– D.P.C 2" Th. P.C.C (1:4:8) TREATED WITH POLYTHIN SHEET & HOT BITUMEN.
3– PLINTH PROTECTION:– 3" Th. P.C.C (1:4:8).
4– SUPER STRUCTURE (1:6") FIRST CLASS BRICK R.C.C STRUCTURE.
5– SLABS, BEAMS LINTEL & STAIRS R.C.C (1:2:4).
6– DOORS & WINDOWS :– SOLID FLUSH DOORS OF DEODAR WOOD WITH COMM PLY & Z SECTION STEEL WINDOWS ALUMINUM.
7– EXT. FINISH:– ICI WEATHER SHEILD PLASTIC EMULSIION OVER 1/2" Th. (1:4) C/S PLASTER.
8– INT. FINISH:– ICI PLASTIC EMUSION OVER 1/2" Th. (1:4) C/S PLASTER.
9– ELECTRIFICATION:– CANCEALED ELECTIC WIRING.
10–SANITARY:– ALL KARAM CERA FITTINGS.
11– PAINTS:– ICI ENAMEL IN WHITE COLOR.

SCHEDULE OF DOOR/ WINDOW

NO.	TYPE	WIDTH	HEIGHT	CILL	DESCRIPTIONS
01	D1	5'–0"	6'–0"	0"–0"	FLUSH SHUTTER GL
02	D2	4'–0"	7'–0"	0"–0"	FLUSH SHUTTER GL
03	D3	3'–6"	7'–0"	0"–0"	FLUSH SHUTTER GL
04	D4	3'–0"	7'–0"	0"–0"	FLUSH SHUTTER GL
04	D5	2'–6"	7'–0"	0"–0"	FLUSH SHUTTER GL
05	W1	8'–0"	6'–0"	0'–4"	ALUMINIUM WINDOW
06	W2	7'–0"	6'–0"	0'–4"	ALUMINIUM WINDOW
07	W3	5'–0"	6'–0	0'–4"	ALUMINIUM WINDOW
08	W5	4'–0"	6'–0"	0'–4"	ALUMINIUM WINDOW
09	W5	3'–6"	3'–6"	3'–6"	ALUMINIUM WINDOW
10	W6	2'–0"	6'–0"	0'–4"	ALUMINIUM WINDOW

SCHEDULE OF AREA

TOTAL AREA OF PLOT	= 2398.62	Sft.
COVERED AREA OF BASEMENT	= 366.00	Sft.
COVERED AREA OF GROUND FLOOR	= 1995.00	Sft.
COVERED AREA OF FIRST FLOOR	= 1804.00	Sft.
COVERED AREA OF SECOND FLOOR	= 894.00	Sft.
TOTAL COVERED AREA OF PLOT	= 5081.00	Sft.

2.5. Demonstrate plot command to print plan with different scale to size and orientations.

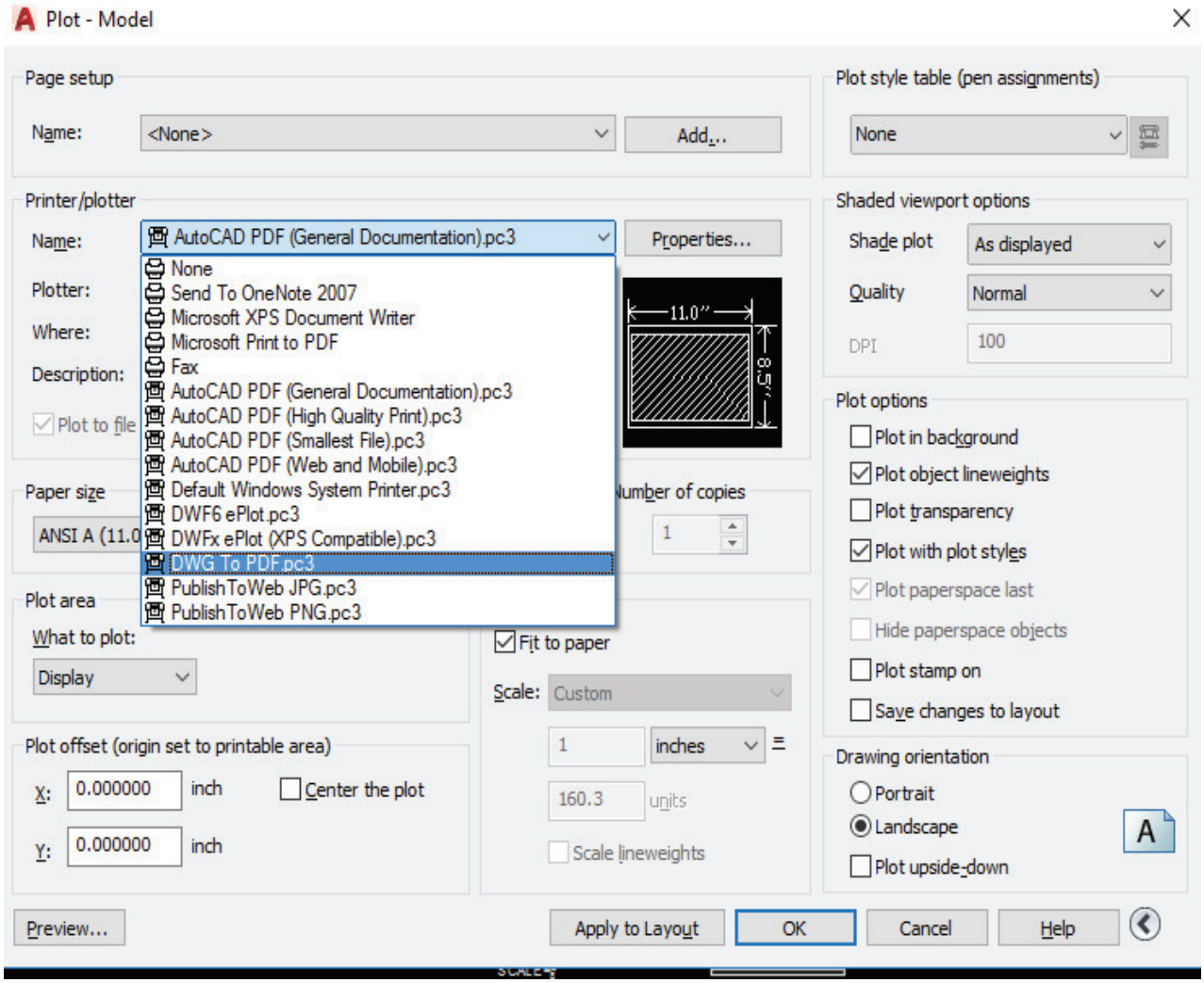
Plotting for Save drawing in different format (e.g. dwg, PDF, JPG).
In this unit learner able to print out the Drawing in different formats like

.PDF
.JPG etc

Note: How we can do working in PDF and JPG printing

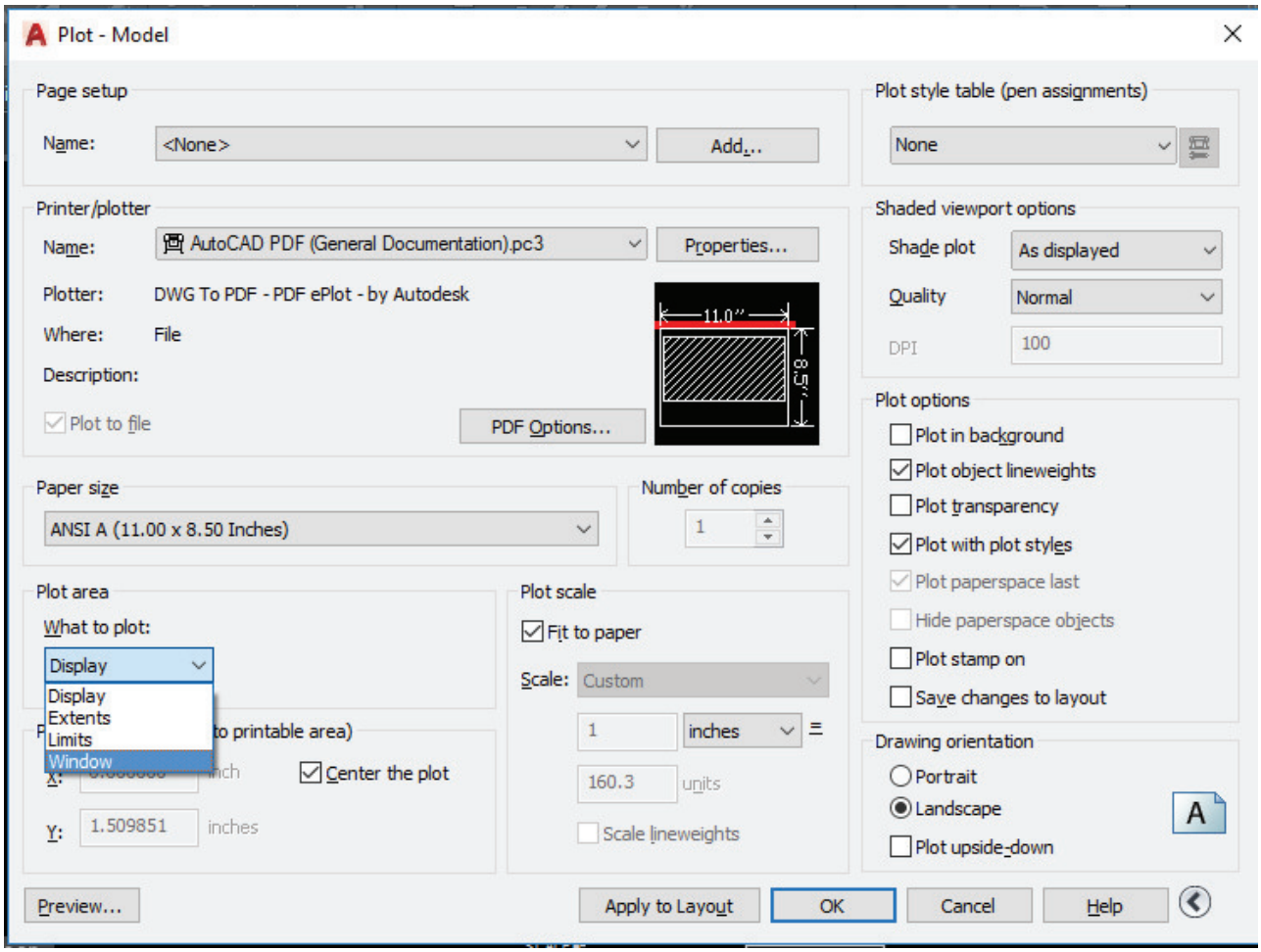
- **Method of Saving Drawing in PDF**

Step 1
Applying command print in AutoCAD then show the dialog box of print / plot like (show in picture)
Then click the PDF option



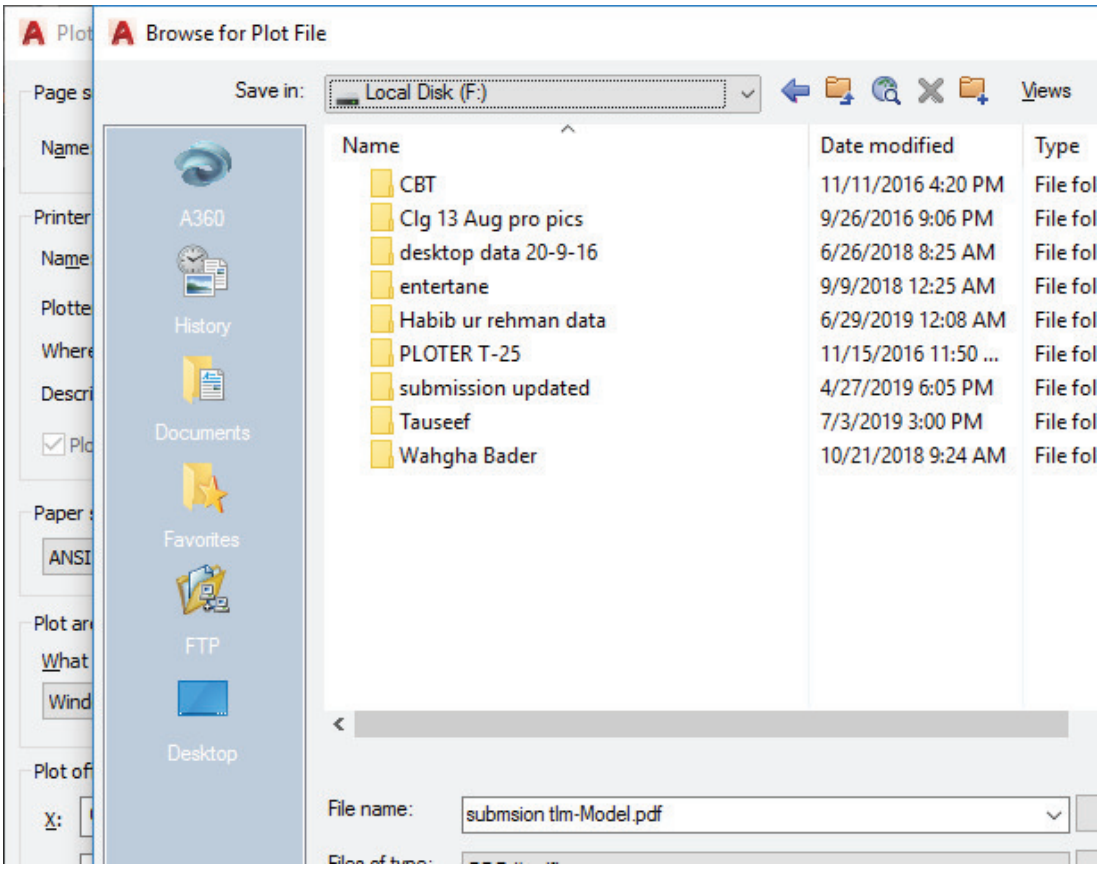
Step 2

Select the Drawing with Window option lick (showing in the picture) and click the OK option



Step 3

Then give the path where you want save drawing lick (showing in the pictures)


Browse for Plot File
Save in:
Local Disk (F:)
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Favorites
FTP
Desktop
Name
Date modified
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CBT
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File fol
Clg 13 Aug pro pics
9/26/2016 9:06 PM
File fol
desktop data 20-9-16
6/26/2018 8:25 AM
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9/9/2018 12:25 AM
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11/15/2016 11:50 ...
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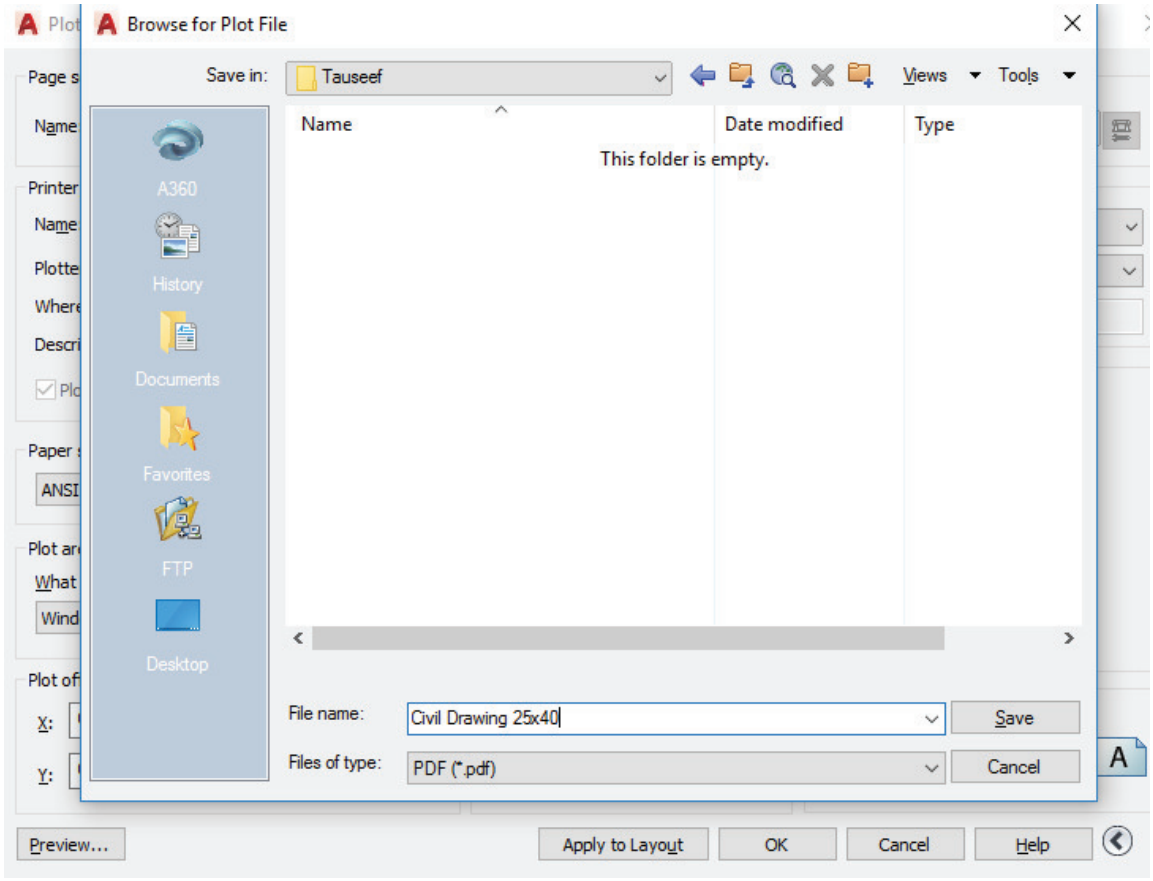
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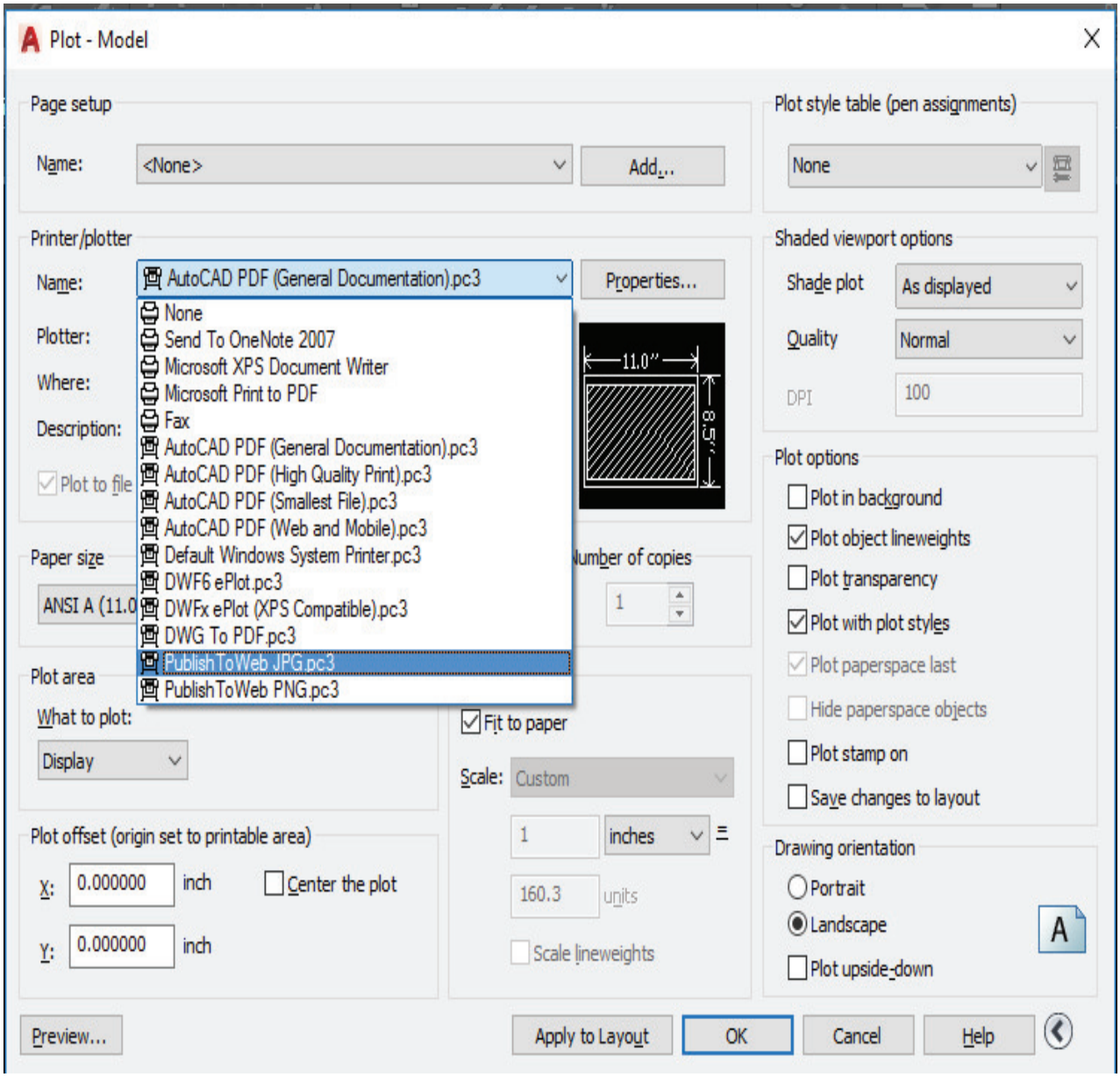
A360
History
Documents
Favorites
FTP
Desktop
Name
Date modified
Type
This folder is empty.
File name:
Civil Drawing 25x40
Save
Files of type:
PDF (*.pdf)
Cancel
Preview...
Apply to Layout
OK
Cancel
Help

Method of Saving Drawing in JPG.

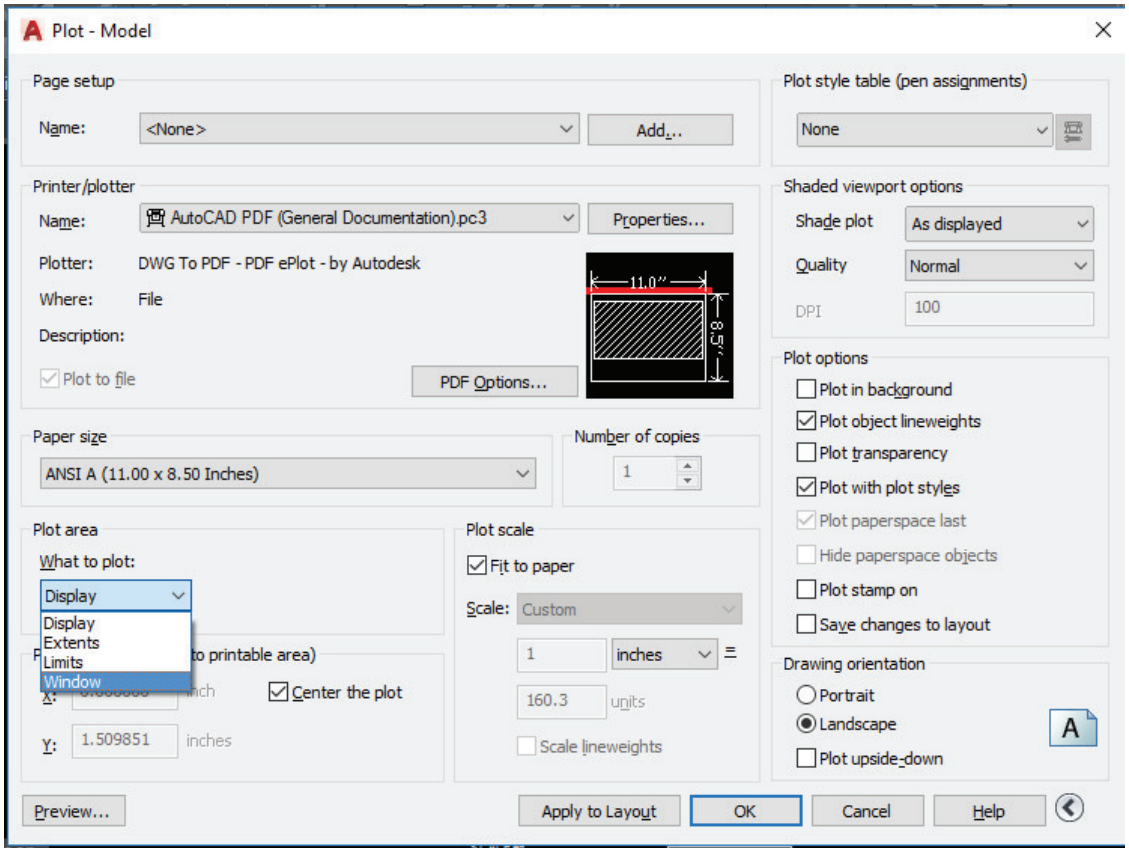
Step 1

Applying command print in AutoCAD then show the dialog box of print / plot like (show in the picture) Then click the JPG option



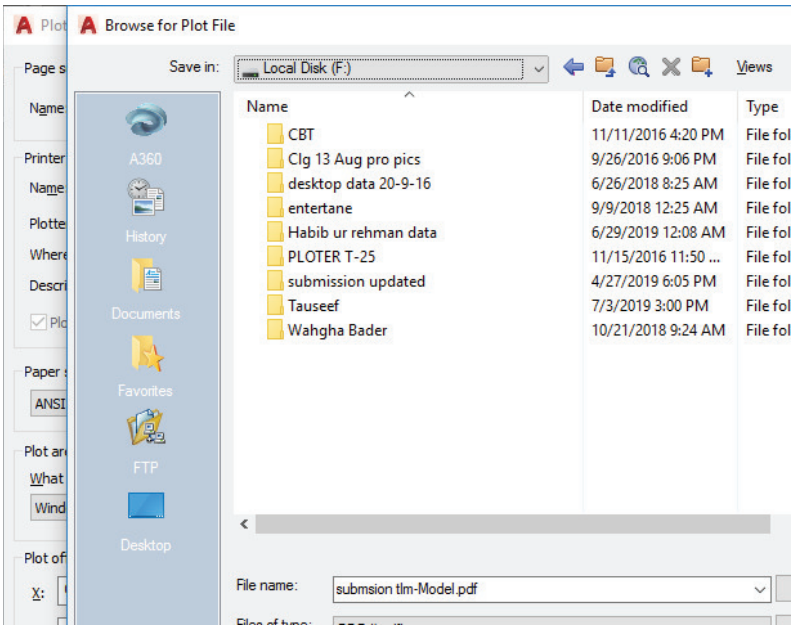
Step 2

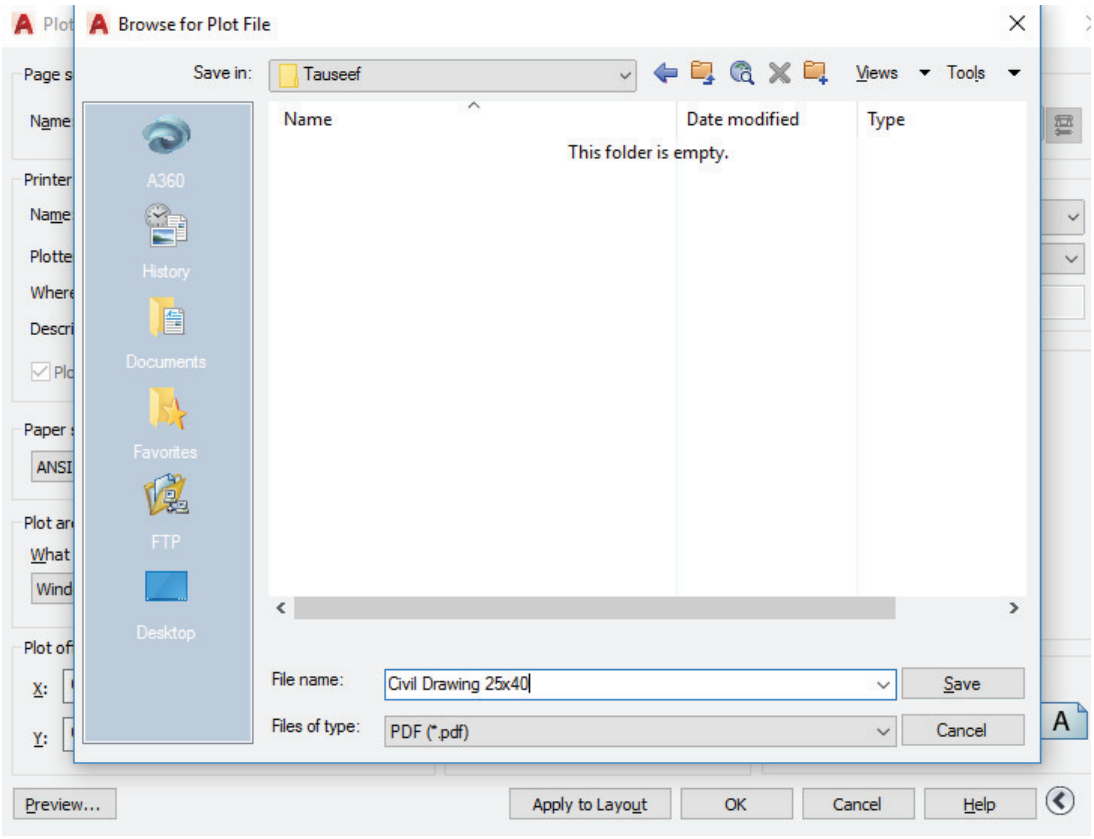
Select the Drawing with Window option lick (showing in the picture)
And click the OK option



Step 3

Then give the path where you want save drawing lick (showing in the pictures)




Browse for Plot File
Save in:
Tauseef
Views
Tools
Name
Date modified
Type
This folder is empty.
A360
History
Documents
Favorites
FTP
Desktop
File name:
Civil Drawing 25x40
Save
Files of type:
PDF (*.pdf)
Cancel
Preview...
Apply to Layout
OK
Cancel
Help

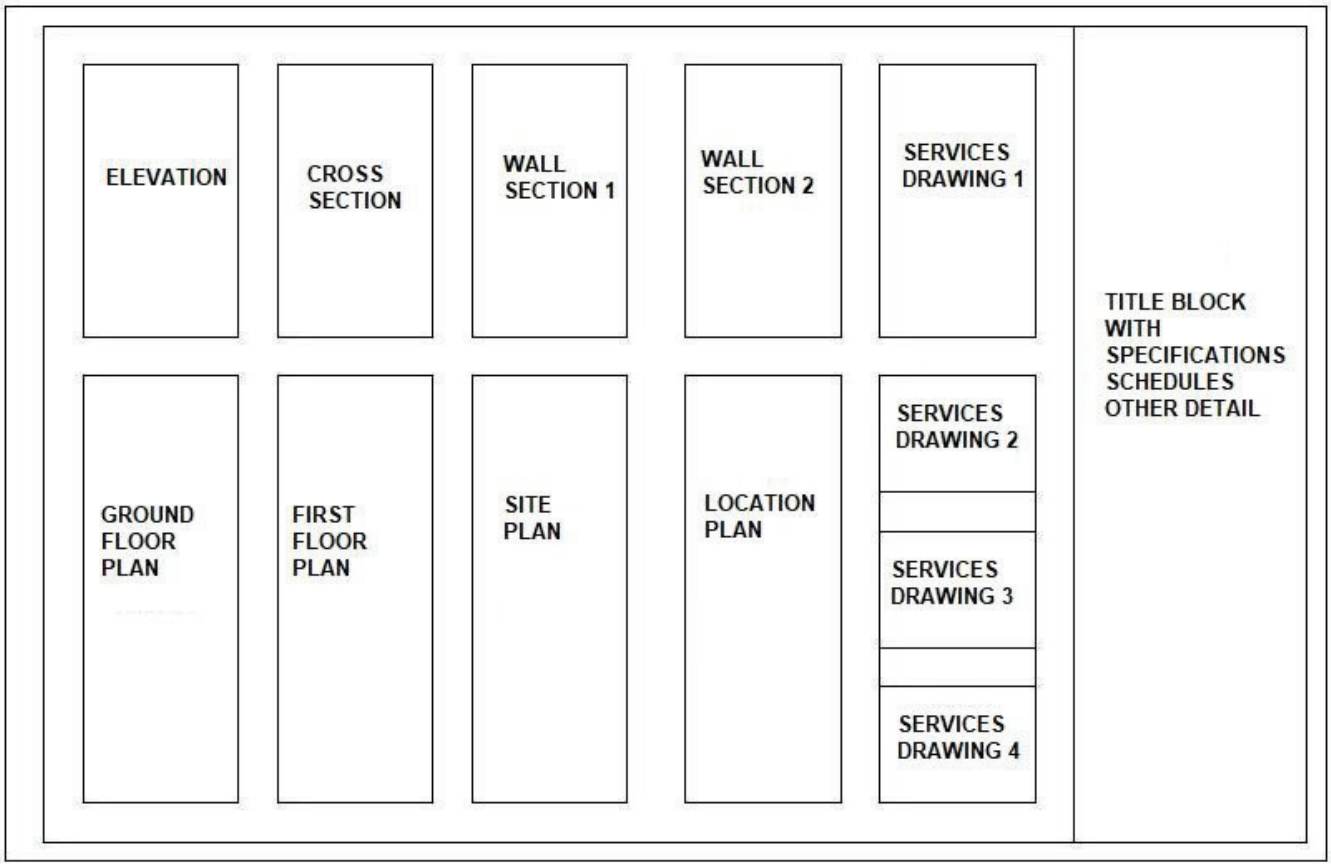
Practice - 1

Develop a set of submission drawings in AutoCAD.

Step 1: Draw and annotate the Ground Floor Plan
Step 2: Draw and annotate the First Floor Plan
Step 3: Draw and annotate the Ground Floor Plan
Step 4: Draw and annotate the Front Elevation
Step 5: Draw and annotate the Cross Section
Step 6: Draw and annotate the Cross sections of walls
Step 7: Draw and annotate the Site plan
Step 8: Draw and annotate the Location Plan
Step 9: Draw and annotate the other main services plans and section.
Step 10: Prepare complete Title along with components
Step 11: Create a layout. Distribute evenly the space of drawing sheet as per requirement. Proposed layout of the submission drawing as per standards is as under.

Ground floor plan at bottom left corner. First floor plan adjacent to ground floor plan to the right. Elevation at top left corner of sheet parallel to ground floor plan. Cross section adjacent to the elevation right side. Sections of walls and columns etc. adjacent to the cross section. Site plan and location plans adjacent to the First-floor plan to the right. Services adjacent to left of the title block which will be to the right side and other annotations (Schedule of openings, Schedule of areas etc.)

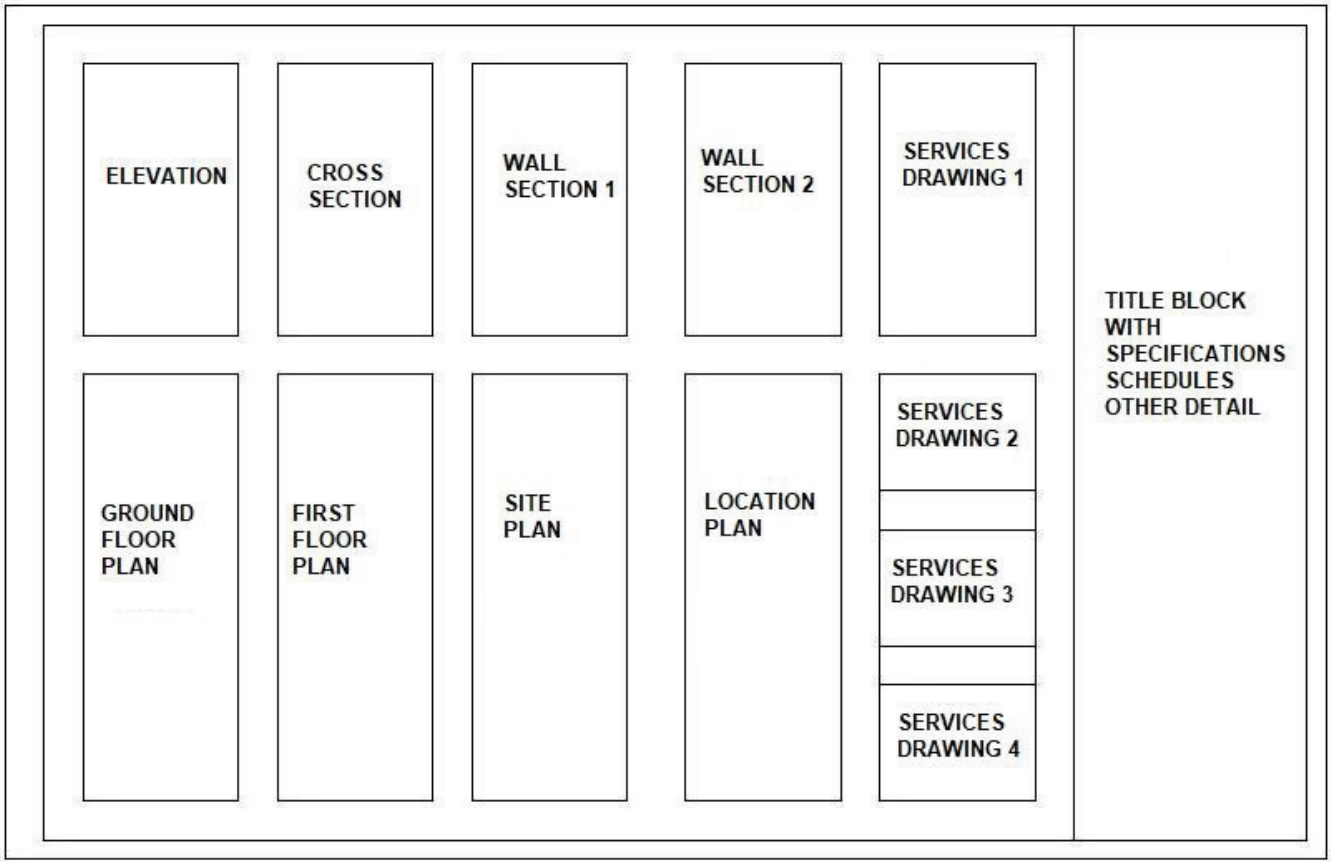
For the purpose take new view ports and adjust the same as per size and location of the concerned drawing.



Practice - 2

Print the completed submission plan plan with the following requirement

Step 1: Open the Submission drawing CAD files



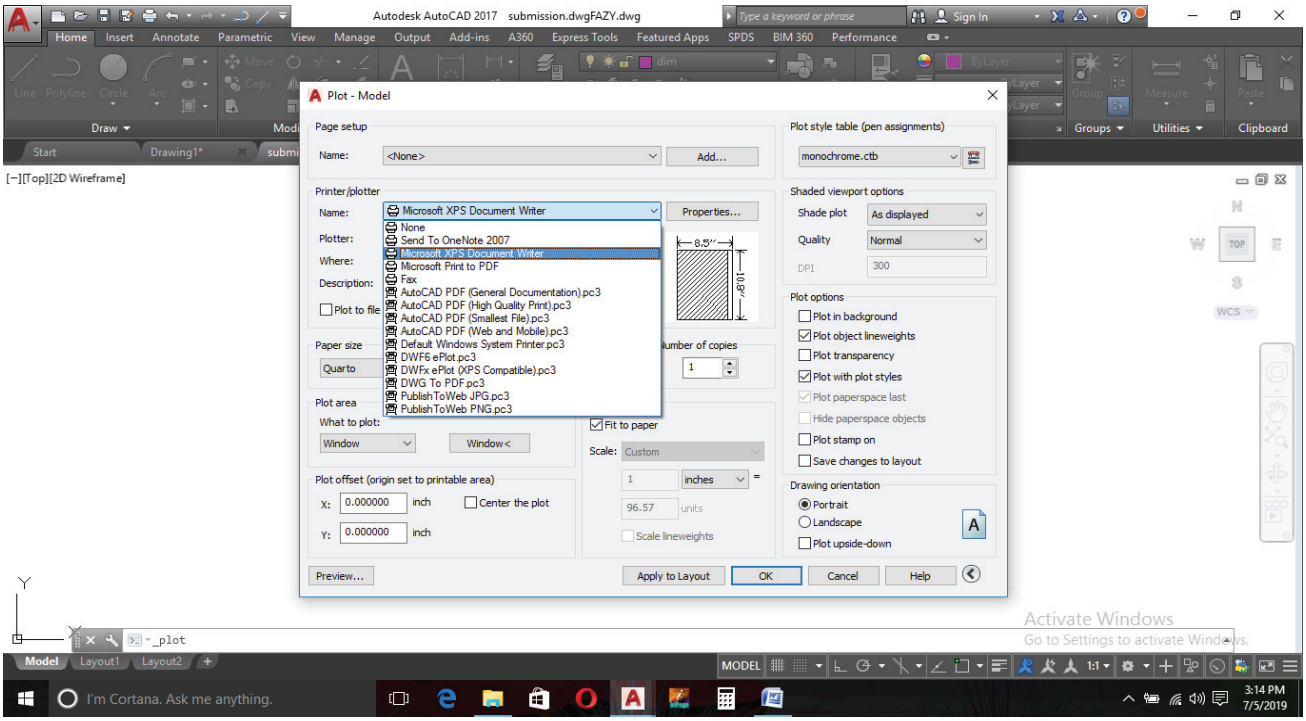
Step 2: Select the command print or with shortkey Ctrl+P then appears dialog box of Plotter

Select the given option

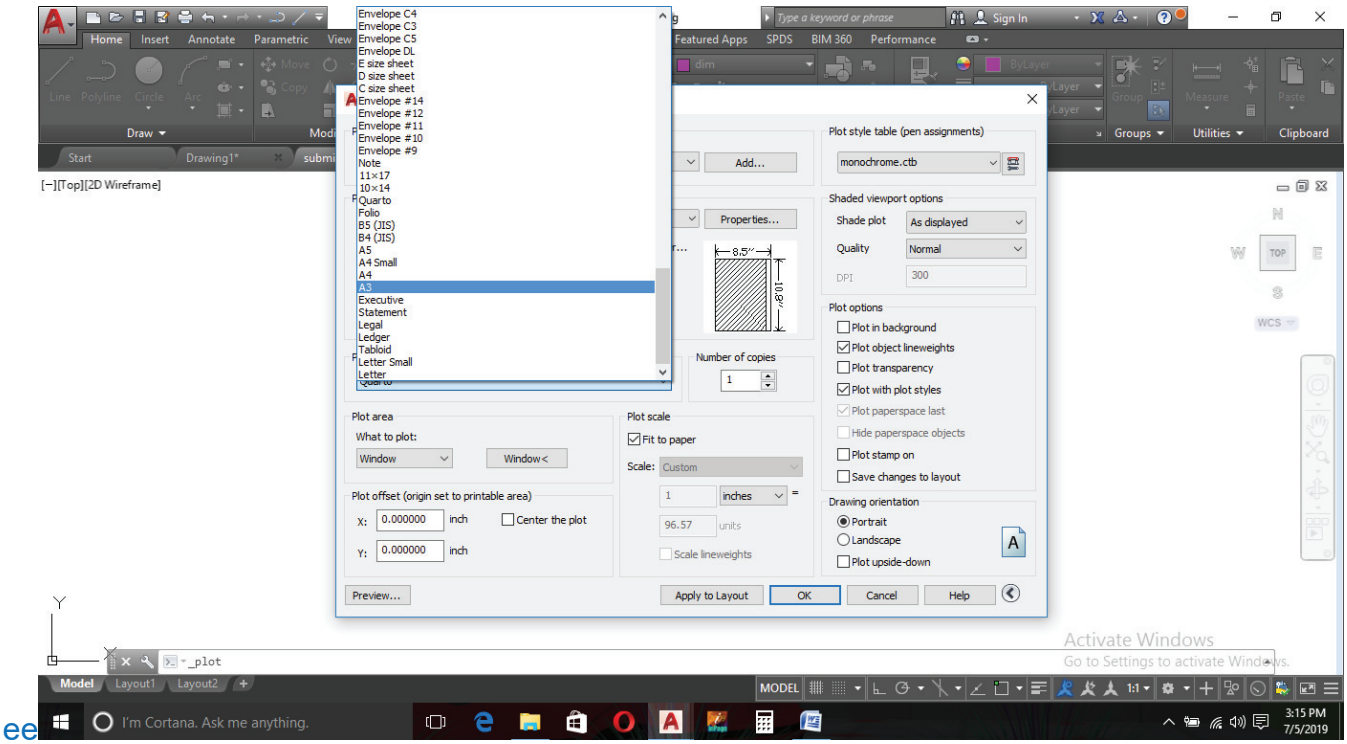
You can set the layout as explained in development of submission drawing. You can rename the layouts. One layout may have one or more parts of drawings.

You can also print the parts of drawings from the model. You can select the parts of drawing with window or extents.

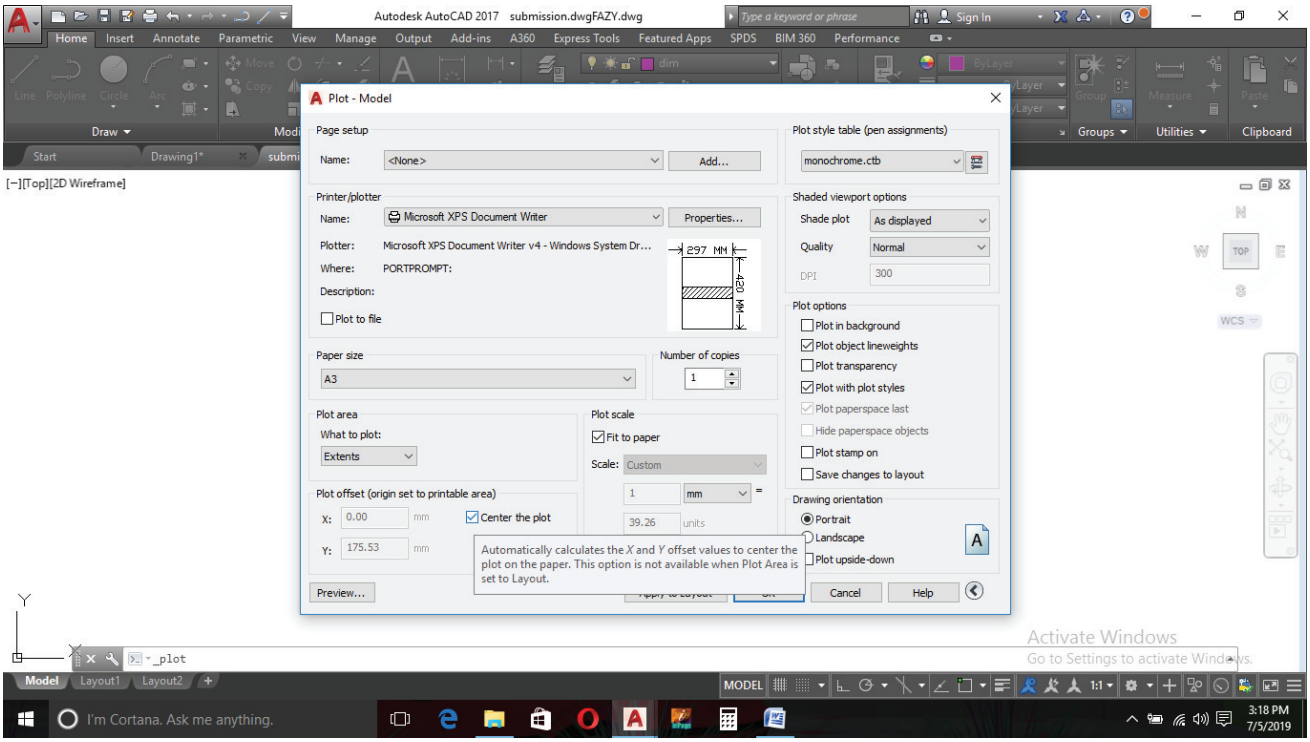
After selecting the print/ plot command the following window will appear. Select the printer/ plotter from which you want to take print out. Select the window option for printing of specific area of drawing. Select the scale if you want to print on some specific scale. Select the paper/ drawing sheet size. Select other options for offsets from left or bottom. Select number of copies to print. Select the paper orientation (Portrait/ Landscape). As shown in the following picture.

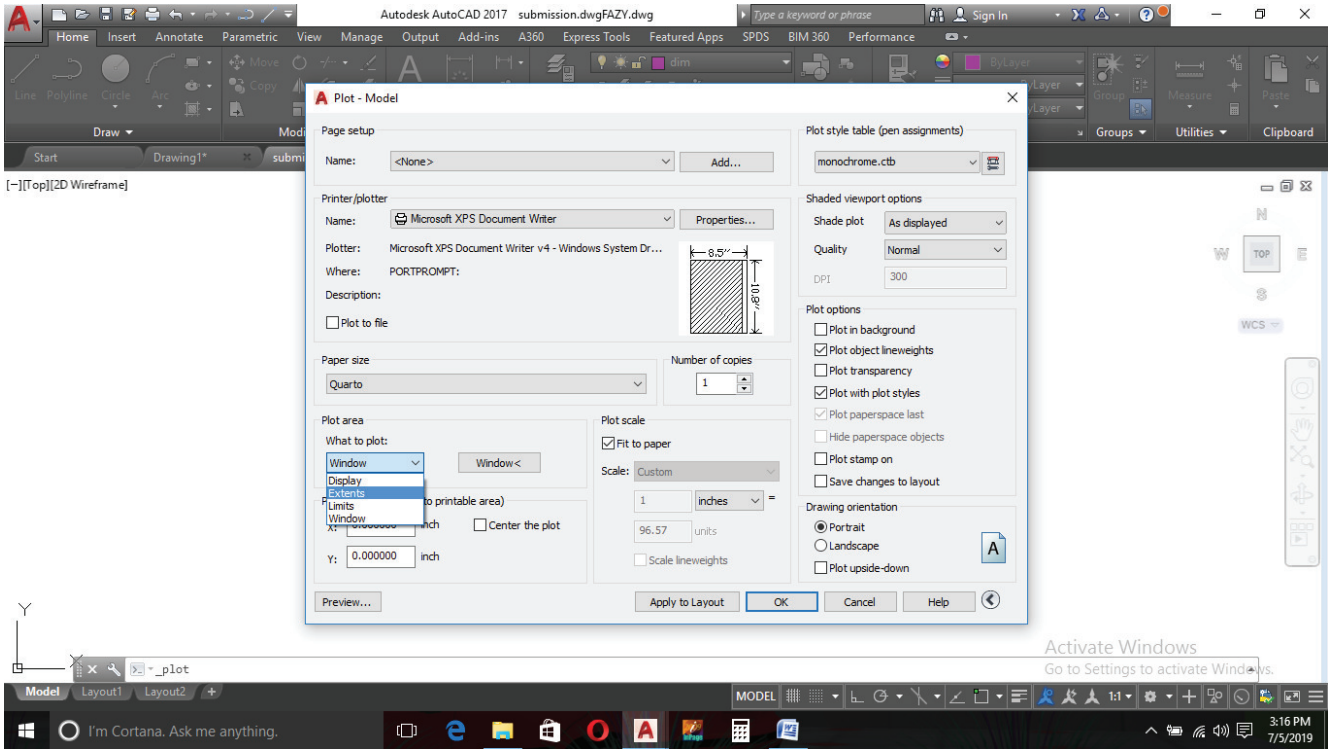


Step 3: Set the paper size: A3



Step 4: Select with Given option: Window to print from model or layout for layout printing.
Set the plot offset: Center
Drawing orientation: Landscape


Autodesk AutoCAD 2017 submission.dwgFAZY.dwg
Plot - Model
Page setup
Name: <None>
Add...
Printer/plotter
Name: Microsoft XPS Document Writer
Properties...
Plotter: Microsoft XPS Document Writer v4 - Windows System Dr...
Where: PORTPROMPT:
Description:
Plot to file
297 MM
420 MM
Paper size
A3
Number of copies
1
Plot area
What to plot:
Extents
Plot offset (origin set to printable area)
X: 0.00 mm
Center the plot
Y: 175.53 mm
Plot scale
Fit to paper
Scale: Custom
1 mm
39.26 units
Automatically calculates the X and Y offset values to center the plot on the paper. This option is not available when Plot Area is set to Layout.
Plot style table (pen assignments)
monochrome.ctb
Shaded viewport options
Shade plot As displayed
Quality Normal
DPI 300
Plot options
Plot in background
Plot object lineweights
Plot transparency
Plot with plot styles
Plot paperspace last
Hide paperspace objects
Plot stamp on
Save changes to layout
Drawing orientation
Portrait
Landscape
Plot upside-down
Preview...
Cancel
Help
[−][Top][2D Wireframe]
_plot
Model
Layout1
Layout2
I'm Cortana. Ask me anything.
3:18 PM
7/5/2019


Autodesk AutoCAD 2017 submission.dwgFAZY.dwg
Plot - Model
Page setup
Name: <None>
Add...
Printer/plotter
Name: Microsoft XPS Document Writer
Properties...
Plotter: Microsoft XPS Document Writer v4 - Windows System Dr...
Where: PORTPROMPT:
Description:
Plot to file
8.5"
10.8"
Paper size
Quarto
Number of copies
1
Plot area
What to plot:
Window
Window<
Display
Extents
Limits
Window
Center the plot
Y: 0.000000 inch
Plot scale
Fit to paper
Scale: Custom
1 inches
96.57 units
Scale lineweights
Plot style table (pen assignments)
monochrome.ctb
Shaded viewport options
Shade plot As displayed
Quality Normal
DPI 300
Plot options
Plot in background
Plot object lineweights
Plot transparency
Plot with plot styles
Plot paperspace last
Hide paperspace objects
Plot stamp on
Save changes to layout
Drawing orientation
Portrait
Landscape
Plot upside-down
Preview...
Apply to Layout
OK
Cancel
Help
[−][Top][2D Wireframe]
_plot
Model
Layout1
Layout2
I'm Cortana. Ask me anything.
3:16 PM
7/5/2019

Summary of Module

This module is designed to provide skills and knowledge to create 2-Dimensional drawings by using various tools and commands. Trainees can create and modify objects and drawings in AutoCAD to meet specific targets according to job requirements.

Trainees will learn to setup drawing interface for required specifications. they will have the skill to setup user interface settings for required specifications. They will have the skills to execute the different commands to draw, modify, dimension, annotate, mode settings, UCS settings, drafting settings, via tool bars, menu options, use of command line window. The Trainees will have the skill to create 2D objects with given measurements by using the commands, tools Co-ordinate system (Coordinate, Absolute, Relative, Polar, etc.). AutoCAD drawing files will be saved by them in different file formats (e.g. dwg, PDF, JPG). They will also edit 2D Objects to meet set standards/ bye laws of controlling agency.

Trainee will get skill to use appropriate command and tools to develop 2D drawings in general. In the specific condition they will develop 2D Drawing with given project specification and measurements. For the purpose of presenting the drawing they will have the skill to create title blocks, layouts as per required scenario. For the hard copy output they will have the skill to plot drawings on scale according to required size of sheets and orientation of drawing sheets. They will have the skill to prepare submission drawings and working/ construction drawings in 2D. The sheets will contain all the necessary information like Schedule of openings, Schedule of areas, Specifications etc.

Question and Answers:

FAQ - 1 **What Is The Purpose Of Auto Cad Software?**

Answer :

i. AutoCAD software provides the design and the shape for the products that needs to be created.

ii. It provides flexible and user friendly features with the tools to design the applications and document the workflows.

iii. This involves aggregate and import models for the formats and usually allows the design to get created without any change in source model.

iv. It provides tools to provide the formats by detailed designing the layouts and drawings using the views automatically.

v. It also has the provision to create detailed design layouts and views can be drawn automatically using the source model.

FAQ - 2 **What Are The Uses Of Auto Cad?**

Answer :

i. AutoCAD software is used to draw and design the documents and the applications with easy customization options.

ii. AutoCAD provides a platform to be used by professionals to create the designs and 3D models.

iii. It allows the creation of the professional technical drawings and conceptual designs used for representation of the logics.

iv. It allows the drafter to provide the finishing touches and designing with the detailing and linking to the online data.

v. It provides suppliers or operational professionals to review the drawings and modify it according to the requirements.

FAQ - 3 **What Is The Main Purpose Of Auto Cad?**

Answer :

i. AutoCAD is used to create the computer aided designs or software applications including drafting.

ii. AutoCAD develops the application in both the 2D and 3D formats and provide the information to the application.

iii. AutoCAD provides tools to design the softwares used in the industry, architects and project management.

iv. It provides an easy way to design the software with the designs and architect it according to the need.

FAQ - 4 What Are The File Formats Used In Design?

Answer :

i. There is a use of native format like .dwg for the AutoCAD and it provides an interchangeable format.

ii. The file format that is interchangeable has the extension as DXF and it provides the data operability.

iii. AutoCAD includes the .dwg format and provide the support as well. It provides a way to use the files that are active.

iv. It provides a way to estimate the total number of active .dwg files that can be made in collaboration with other files.

v. It provides languages that can be used and the localization part of the software can be modified to meet the requirements.

FAQ - 5 Question 5. What Is The Function Of Vertical Integration?

Answer :

i. AutoCAD uses the vertical integration program to enhance the architectural designing of 3D objects.

ii. The 3D objects can include walls and other things that are associated with the data having intelligence and association with the simple objects like lines and circles.

iii. The data is programmed such that it represents only the architectural products and the extracted files.

iv. The information for the data and the actions on the like modifies and creates the relationship of an object.

v. It consists of the tools that allow the estimation and other objects related representation in the 2D drawings.

vi. The elevations and sections used as a 3D architectural model specifies the standard calculations used in creating applications.

FAQ - 6 Question 6. What Is The Use Of Variants In Auto Cad?

Answer :

i. AutoCAD uses lots of variants including the releases that provide capabilities to build an application.

ii. The 3D capability that is being provided by the AutoCAD gives fewer rises to the releases of the applications.

iii. Variants are used to increase the variations present in the application or the package used in particular program.

iv. AutoCAD provides variants that help in creation, visualization and rendering of the 3D models that provide the 3D printing as well.

v. Variants provide a way to use different functionalities of the function in the application and execute it according to the needs.

FAQ - 7 **What Are The Differences Present In The Software's Features?**

Answer : The difference in the software's features is shown as:

i. 3D Capabilities: this is a way through which AutoCAD can view the overall progress of creation, visualization and rendering of the 3D objects.

ii. Network Licensing: is being provided by the AutoCAD to be used for the multiple machines over the network.

iii. Customization: is another feature of AutoCAD that doesn't support LISP, ARX, and VBA for the customization part.

iv. Management and automation capabilities: is being provided with the management and automate the whole process of creation.

FAQ - 8 **What Are The Features Involved With The Auto Cad Ws?**

Answer :

i. AutoCAD is a platform that provides Mobile Apps (iOS) to be created by providing certain options for view, edit and share.

ii. The user can easily share the applications wherever they go on fly and it makes creating application less time consuming.

iii. The applications can be downloaded and installed from many other places that require licensing for the mobile applications.

iv. The users can save the file in whichever way they want and the application can run on any platform.

v. AutoCAD applications provide a way to let the user share information on cloud and use the technology to enhance more features.

FAQ - 9 **What Are The Different Ports Used In Different Os?**

Answer :

i. AutoCAD doesn't have major improvements and some changes can be made to improve the capabilities of it.

ii. It requires the improvements to be made on the ports so to provide the easy accessibility to the applications and devices.

iii. The changes have been made to suit the environment and it included:

iv. Canvas control: this is being done in an increased manner and it controls the area that is being defined by the canvas.

v. Associated arrays: this provides the arrays that are being associated with other arrays or other parts.

vi. 3D model manipulation: that is being done by the tools used in the operating systems and allows easy portability of the application.

FAQ - 10 What Is The Procedure To Create User Interface?

Answer :

i. The user interface can be created by using the command prompts to draw the plots and dialog boxes.

ii. The displaying of the dialog boxes can be seen by the use of PLOT command and the external database (ASE) commands.

iii. Setting of CMDDIA to 1 takes place that enables the dialog boxes to run the command and enter the spaces of use.

iv. The user interface creation also requires the command line to display the entire file so that it can be easily customized or edited.

FAQ - 11 What Is The Procedure To Draw A Line More Than One Time And Save It Automatically?

Answer :

i. AutoCAD allows the file to be written in multiple instances of the processes and it limit the resources that needs to be used as well.

ii. When a new line needs to be drawn the process opens up another file in a new session to write the file.

iii. AutoCAD allows saving multiple drawings to be saved for each session and it can be used to create the application.

iv. The files are saved by using the file extension as .dwg and it can be modified using the browser.

v. The file extension needs to be hidden and it needs to show allowing the selection of the option as well.

vi. The file modification takes place by checking the AutoCAD operations and opening up of the drawing.

FAQ - 12 What Is The Procedure To Remove The Empty Layers?

Answer :

i. The empty layers can be removed from the drawing by using the all objects residing at once place.

ii. The references of the layers are also removed so that it appears to be empty and can easily be created.

iii. If the layer is empty then the PURGE will not be able to remove the layers from the drawing.

iv. The layer can be made frozen on the viewport that is visible to the object and provide the definition of the object too.

v. The removing of the layer is possible due to the drawing that can be made using the EXPORT command and the result can be created in the DXF file.

FAQ - 13 What Are The Steps Need To Be Taken To Replace The Buttons On Toolbars With Smiley?

Answer :

i. AutoCAD have the place for button icons in the toolbar and tool boxes that it gets replaced with the smiley.

ii. AutoCAD provides the buttons for the template files that can be edited after customizing the toolbars.

iii. The changes are being provided by the template files that can cause the menu resources and allow the creation of files according to the requirements.

iv. To use smiley instead of buttons following steps are required and needed:

v. Open the AutoCAD menu and edit the button file using the bitmap file that is saved in the support path.

vi. Move or copy the icon files that are used for different menus toolbars and open it according to the menus chosen.

vii. The button properties can be seen and an editor dialog box will be given according to the save as button.

viii. The directory is specified with the supported path and the Apply button properties are also being given for the AutoCAD properties.

FAQ - 14 What Are The Features Being Corrected By Autocad?

Answer :

i. AutoCAD identifies the problem and correct it by removing the corruption with the drawing parts.

ii. It involves adding of the vertices to the poly-lines with a provision to add additional vertices.

iii. The poly-line provides only the provision of using one vertex and the vertex can be added on run.

iv. The corruption can be neglected or corrected by finding out the exact location of the poly-line that has zero vertices.

v. The objects can be deleted after there is no use of it or can be removed if there is no use of them in the system.

FAQ - 15 What Are The Steps To Enable The Drag And Drop Feature In Autocad?

Answer :

i. AutoCAD provides a way to drag and drop the elements by the use of noun and verb that allows the object to move from one place to another.

ii. AutoCAD provides an option to rotate or erase the selected object and allows the action to be taken on the application.

iii. The editing functions like MOVE and ERASE can be used to provide the erasing of the objects and noun/verb.

iv. Open the system option dialog box and choose from there Noun/Verb and turn it on from the menu bar.

v. The selection tab can be selected by using the noun/verb selection of the options with the mouse clicks and opening of the menus.

FAQ - 16 What Are The Steps Involved In Setting Up The Default Drawing Directory?

Answer :

i. Default drawing directory is the one that involves sub directories containing the information using the windows commands.

ii. AutoCAD uses the navigation paths to travel the directories and it adds a shortcut for the directories that doesn't have a shortcut.

iii. The application can be highlighted that needs to be built in and then drag and drop features are used to place the application.

iv. The properties of the application are selected from the menu and dialog boxes used to display it on the front.

v. AutoCAD uses the directory system to use the commands like OPEN that allows the selection of the files and create the shortcut in default directories.

FAQ - 17 What Is The Procedure To Copy The Dimension Styles From One Drawing To Another?

Answer :

i. Copying the dimension of styles from one drawing to another requires setting up the particular dimension style.

ii. Setting up the dimension style also requires the use of documents and creation of the styles while using the blank document.

iii. The document is saved by using the document as a Drawing template and then new references gets created by the template document.

iv. Templates define the system variables that can be consistent across all the platforms and provides the drawings like layer styles, units and blocks.

v. It can be copied by copying the styles on single case basis and the drawings can be done by seeing the current drawing.

vi. Using of the design center makes it easy for the AutoCAD tools to allow the browsing and copying of the styles and other drawings activities.

FAQ - 18 What Are The Steps Involved In Copying A Closed Drawing?

Answer :

i. The copying of the closed drawing takes place from the toolbar provide in the design center of the AutoCAD.

ii. Design center allows the modification of the drawing to be done using the graphical interface.

iii. Open drawings are given to display the content and copy the closed drawings easily by using the Tree View option.

iv. The drawing is involved with the drawing elements that can be copied with the defined objects that have the similar type.

v. Dim style gets copied from one to another and it provides a drag and drop feature that gets opened into an open document.

FAQ - 19 What Is The Way To Hide The Specific Layers When Plotting?

Answer :

i. The prevent layers used using the plotters for plotting provides the layer manager that allow easy options to customize the application.

ii. The layers used in layer manager have specific options like:

iii. Turning off the layers

iv. Freezing the layers

v. Turning off the layers for plotting

vi. Layers used in the plotting remain visible on the screen and doesn't provide the output to the printer.

vii. Individual layers can also be set up in specific viewports that allows drawing of the layers that contains the systems applications and options.

viii. It uses the viewport concept that allows the different layers to be frozen on the view port and this way it can be hidden from other layers.

FAQ - 20 Why Autocad Software Is Used?

Answer :

i. The shape and design of the products that is required to be created is offered by AutoCAD software.

ii. This software offers features that are user friendly and very flexible with some specific tools to develop applications and the workflow is documented.

iii. Aggregating and importing models is involved in it and most commonly permits to develop design without making any changes in the original model.

iv. It offer some specific tools to present formats by designing layouts in detail and views can be used in drawings automatically.

v. Also, it has some specifications to develop detail design layouts and automatically views are drawn by making use of original model.

FAQ - 21 Give Autocad Uses?

Answer :

i. AutoCAD software is responsible for designing and drawing the documents and applications with simple customization options.

ii. A platform is offered by AutoCAD for professionals to generate attractive designs and some 3D models.

iii. It permits conceptual designs and qualified technical drawings formation that is effectively used for logical representations.

iv. It permits drafter to offer designing and finishing by connecting to online information.

v. It offers operational experts or suppliers to evaluate drawings and change it according to the necessity.

FAQ - 22 What Is The Main Reason For Using Autocad?

Answer :

i. Mainly, AutoCAD is responsible for developing designs that are computer aided or some software application that contain drafting.

ii. Application can be developed in 2D and 3D formats using AutoCAD and offer information to application.

iii. Some specific tools are offered by AutoCAD to develop software used in the market, project management and architectures.

iv. It offers best way to develop software with designs and build it according to the requirement.

FAQ - 23 What File Formats Are Used In Design?

Answer :

i. There is native format use such as .dwg for AutoCAD and it offers format that can be exchanged.

ii. The format of file that can be exchanged has DXF extension and it offers data operability.

iii. dwg format is included in AutoCAD and give the support. It gives a method to use active files.

iv. It gives a way to approximate total file having extension .dwg that is created in association with other files.

v. It offers languages that are used and software localization part can be changed to meet the needs.

FAQ - 24 Question 24. Give The Variants Usage In Autocad?

Answer :

i. Multiple variants are used by AutoCAD that include releases offering abilities to create an application.

ii. The 3D ability offered by AutoCAD provides few rises to the application releases.

iii. Variations are increased by variants that are in the application or the package used in specific program.

iv. AutoCAD offers variants that help in formation, visualizing and depicting 3D models that offer even 3D printing.

v. Variants offer best method to make use of various functionalities of function and evaluate it according to the requirements.

FAQ - 25 Give Features Involved In Autocad Ws?

Answer :

i. A platform that offers Mobile Apps to be developed by giving some options to view, share and edit is AutoCAD

ii. Applications can be easily shared by user when they go on fly and the applications can be developed in less time.

iii. Application are downloaded and installed from different places that need license for all the applications developed for mobiles.

iv. Files can be saved by the user according to their desire and that application can be run on any different platform.

v. The application based on AutoCAD offer best way to let information shared by the user on cloud and use technology to improve features.

FAQ - 26 Describe Procedure To Create User Interface?

Answer :

i. Command prompts are used to sketch dialog boxes and plots to create user interface.

ii. The dialog boxes display is seen by making use of some external commands or PLOT command.

iii. Set CMDDIA to 1 takes place that allows dialog boxes to run command and enter use spaces.

iv. The creation of user interface needs the command line to show complete file so that it can be edited or customized very easily.

FAQ - 27 Which Key Combinations Issues The Isoplane Command?

Answer: CONTROL and E or F5

FAQ - 28 The Effect Of Qtext Being On Is To?

Answer : speed up drawing regeneration by replacing text with rectangles

FAQ - 29 Which Is An Autocad Font For Mathematical Symbols?

Answer : MATHC

FAQ - 30 Which One Key Combinations Will Toggle Coords?

Answer : Either F6 or CONTROL and D

Test Yourself

Multiple Choice Questions (MCQs)

1) Which command convert discrete objects in polyline?

(a) Union
(b) Subtract
(c) Join
(d) Polyline

2) When drawing in 2D, what axis do you NOT work with?

(a) X
(b) Y
(c) Z
(d) WCS

3) To print the entire project, you will choose to regulate what to plot?

(a) Display
(b) Extents
(c) Limits
(d) Window

4) If I want to draw a line in the direction 07:30 (local time) will give an angle?

(a) -135 degrees
(b) 270 degrees
(c) -225 degrees
(d) None of the above

5) What is the difference between the Scale command from the command Zoom?

(a) Scale for single object, while the Zoom whole plan
(b) No difference
(c) A Scale can grow / shrink a shape up 10 times, while the Zoom has no limits
(d) A Scale changes the size of objects, while the Zoom changes the visibility of the project

6) The primary difference between the Model tab and the Layout tab(s) is ---------?

(a) The Model tab is used for drawing in 3D and a Layout is used for drawing in 2D
(b) The Model tab is where you create the drawing and a Layout tab represents the sheet that you will plot or print on
(c) The color of the background
(d) The Model tab displays the drawing you are copying from and the Layout tab is where you lay out the new drawing

7) Which state grid is used to design persSSP

(a) Parametric (b) Isometric
(c) Pro-optic (d) Rectangular

8) What time (according to the clock) are 270 degrees according to the conventional time?

(a) 12 exactly (b) 6 exactly
(c) 9 exactly (d) 3 exactly

9) When to fix a block attribute?

(a) When I make the block (b) After fix the block
(c) No matter the number

10) Which state grid is used to design peSSPective?

(a) Because so one can distinguish man
(b) since this is the limit of graphics cards
(c) For each color we have 256 shades and colors combination third
(d) Because we want compatibility between PC and Macintosh

11) Which of the following is NOT a property of an object?

(a) Line weight (b) Measure
(c) Hyperlink (d) Elevation

12) By what symbol shows the snap point to the closest point?

(a) With circles and dots in the center (b) With two triangles
(c) With three orthogonal (d) With Diamond

13) What you cannot create from the command Offset?

(a) Vertical straight (b) Concentric circles
(c) Three parallel lines (d) Parallel arcs

14) What is the usefulness of viewports?

(a) Allows us to see the screen or on paper different views of the same project
(b) Give us the ability to see projects have become a newer version of AutoCAD from us.
(c) We can make a change in one part of the plan, without affecting the rest
(d) None of the above

15) What are the various options from left to right and the opposite direction?

(a) Choose a different category of objects
(b) select objects according to their color
(c) Select objects according to their position
(d) No difference

16) When in absolute Cartesian coordinates have points A (10,8) and B (6,5), then to make a line from A to B with relative polar coordinates will write?

(a) @ -5 <36.88 (b) @ 4 <30
(c) @ 5 <216,88 (d) @ 3 <60

17) Which of the following is not a keyboard shortcut of AutoCAD?

(a) Ctrl + P (b) Alt + F4
(c) Ctrl + F4 (d) Alt + B

18) What is the minimum allowable number of layers in a drawing?

(a) 0 (b) 5
(c) 1 (d) 2

19) When should I use the Block Editor?

(a) To write text block (b) To fix outer block
(c) To fix dynamic block (d) To store it in another version of AutoCAD

20) What setting gradient allows us to fill an open area?

(a) Gap (b) Tolerance
(c) Transparency (d) Open

21) Which is corresponded to zoom mouse wheel?

(a) Zoom in / zoom out (b) pan & scan
(c) extents / all (d) scale

22) What does associative hatch?

(a) Monitors the changes in shape that fills
(b) Relates to the other hatch plan
(c) Both of the above
(d) None of the above

23) What is the command used for Plagiostomi angle?

(a) Chamfer (b) Fillet
(c) Offset (d) Mirror

24) What command allows us to select objects based on some status?

(a) Properties (b) Qselect
(c) Pselect (d) Attributes

25) How many SNAP points does an object have?

(a) 1 (b) 4
(c) 5 (d) Depend on object

26) Which of the following file extensions cannot open the AutoCAD?

(a) dwg (b) dxf
(c) dot (d) dws

27) A surveyor with a headband to measure the dimensions of a site, he makes measurements by?

(a) No one method (b) Related Cartesian coordinates
(c) Absolute polar coordinates (d) None of the above

28) The origin of a drawing is at?

(a) 0,0 (b) 1,0
(c) 0,1 (d) 1,1

29) How to make a random line with an angle of 40 degrees to the x axis?

(a) will write 0 <40 (b) will write 2 <40
(c) will write 3<40 (d) will write 4 <40

30) Scaling objects make them--------?

(a) Smaller (b) Bigger

(c) Either smaller or bigger (d) None of the above

Answers key:

1	**C**	2	**C**	3	**C**	4	**B**	5	**D**
6	**B**	7	**B**	8	**B**	9	**A**	10	**C**
11	**B**	12	**C**	13	**A**	14	**A**	15	**C**
16	**A**	17	**D**	18	**C**	19	**C**	20	**B**
21	**A**	22	**A**	23	**A**	24	**B**	25	**D**
26	**C**	27	**A**	28	**A**	29	**C**	30	**C**

COMPUTER AIDED DESIGNING (CAD)

Teaching and Learning Guide

Module-3

National Vocational Certificate Level 2

Version 1 - August 2019

Module 3:

Develop 3D Objects using AutoCAD.

Objective:

The Objective of this module is to provide skills and knowledge to create 3-Dimensional models by using various tools and commands in AutoCAD software. You can demonstrate your skills to modify 3D objects and models to ensure job requirements. You can present a rendered 3D Model to present final outcomes.

Learning Units:

After Completion of this learning Units, you will be able to:

- Develop 3D Objects
- Manipulate 3D Objects Using 3D Editing Tools
- Render 3D Model

Learning Unit 1:
Develop 3D Objects

Objective:

In this learning unit you will learn how to setup the interface for 3D development, save file with desired name and location, create 3D objects and modifying objects. After completion of this learning unit you will be able to understand following.

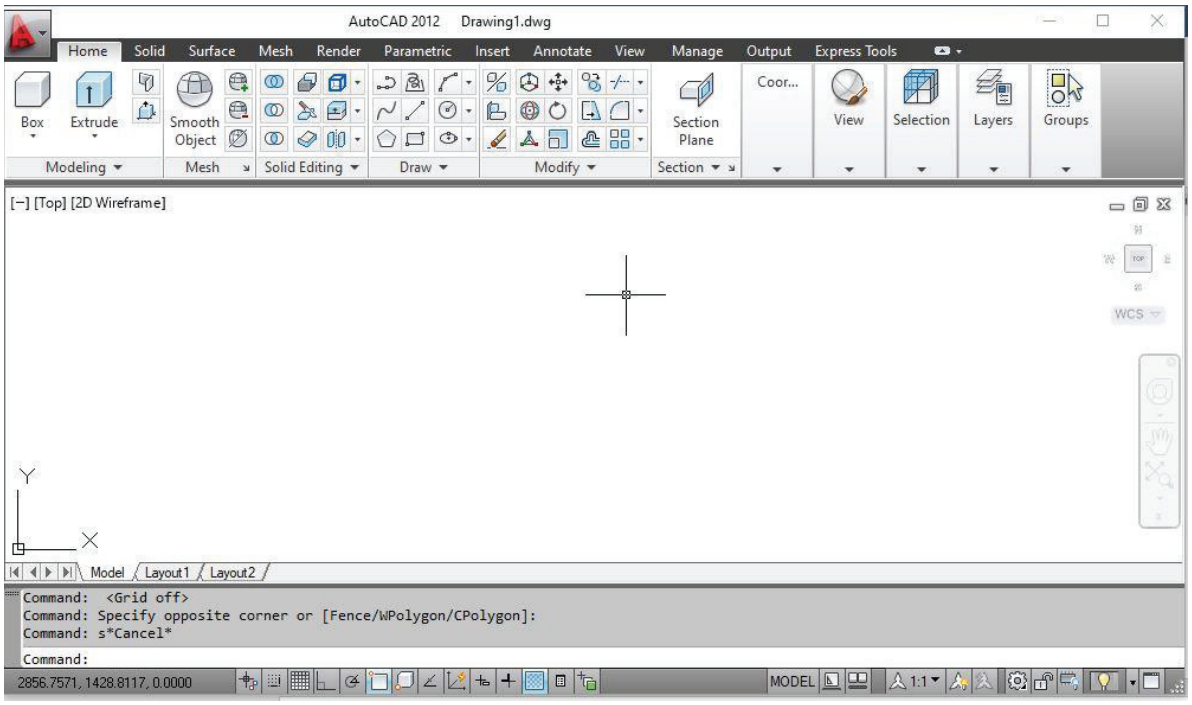
Learning Outcomes:

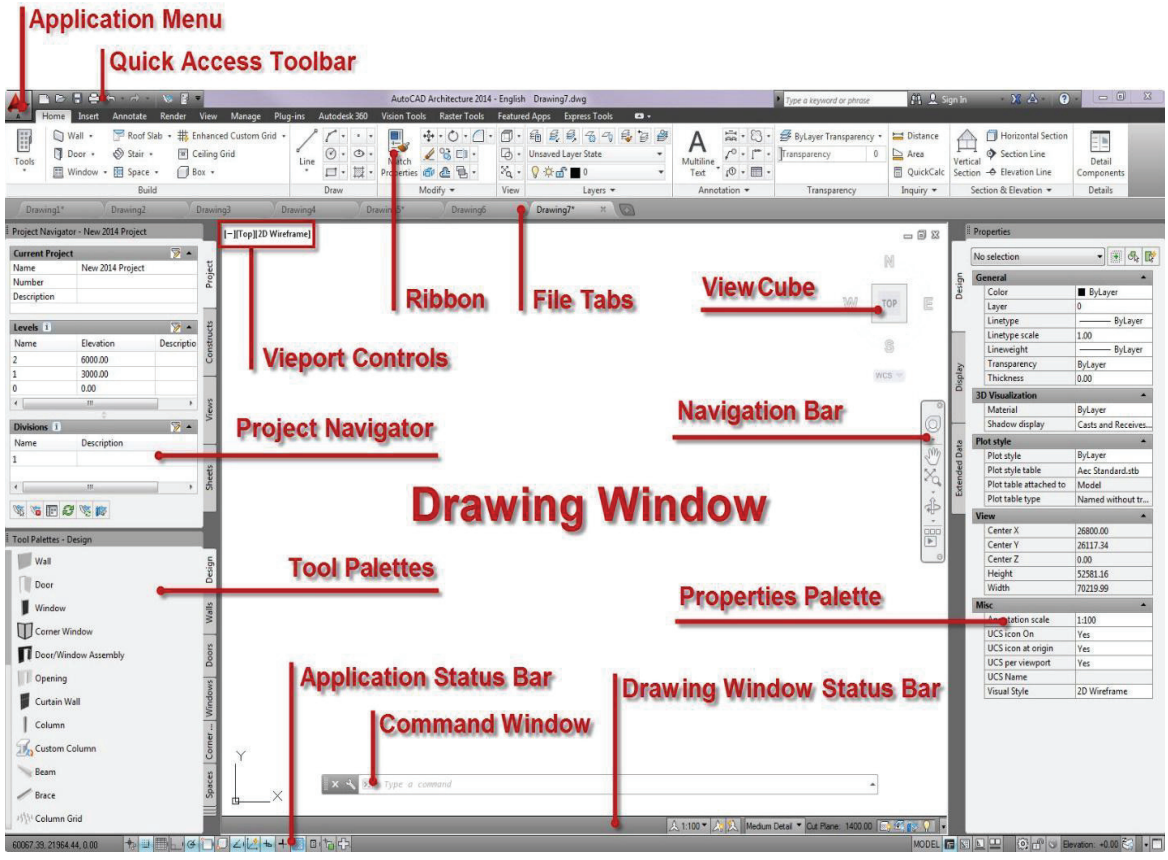
After Completion of this learning outcomes, you will be able to:

- Setup & Save 3D Drawing Interface for Required Specifications.
- Setup 3D user interface setting for required specifications.
- Create 3D objects with given measurements.

1. Setup & Save 3D Drawing Interface for Required Specifications

The following is AutoCAD's 3D Basic interface. The 3D Basic ribbons are as follows:





1.1. Setting UP the 3D Workspace

So far, you've been using the Drafting & Annotation workspace to create your drawings in 2D. Your first task in transitioning into 3D begins by switching to a new workspace for working in 3D and changing how AutoCAD displays the available tools.

1.1.1. Workspaces:

AutoCAD workspaces are sets of menus, toolbars and dockable windows (such as the Properties palette, Design Center, and the Tool palettes window) that are grouped and organized so that you can work in a custom, task- oriented drawing environment.

1.1.2. Step by Step Operation

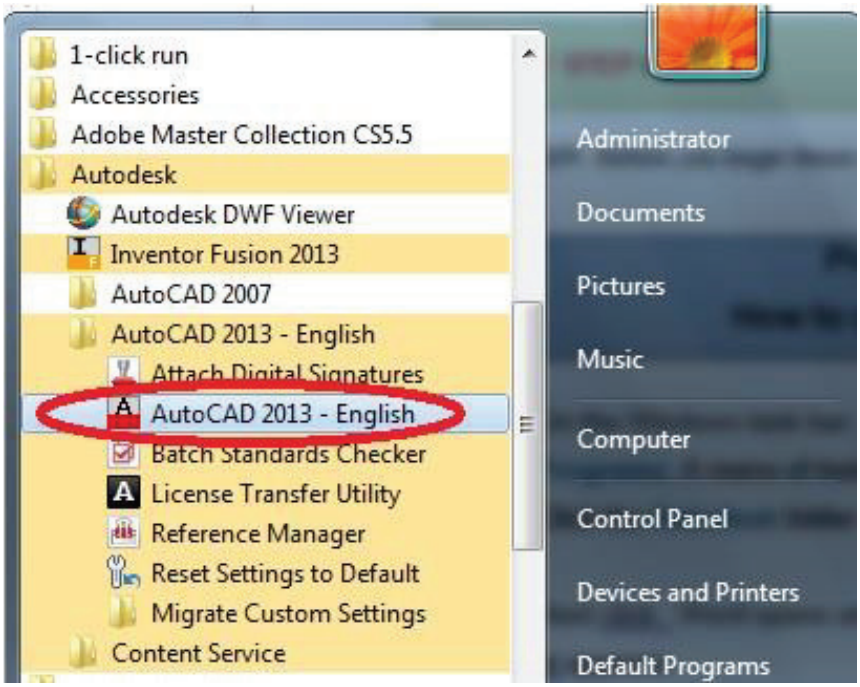
Get ready before you begin these steps, be sure to turn on and/or log on to your computer.

Procedure

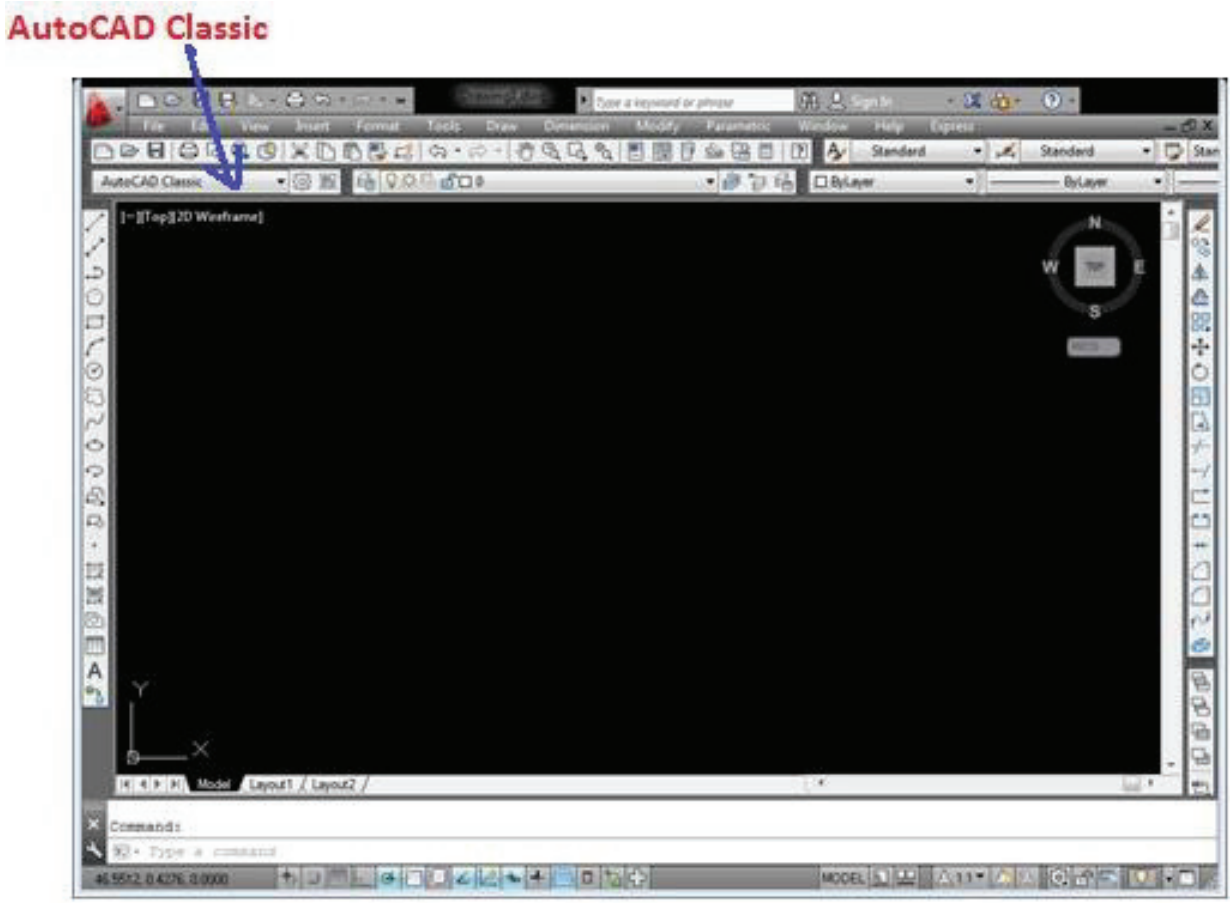
How to set 3D Workspace

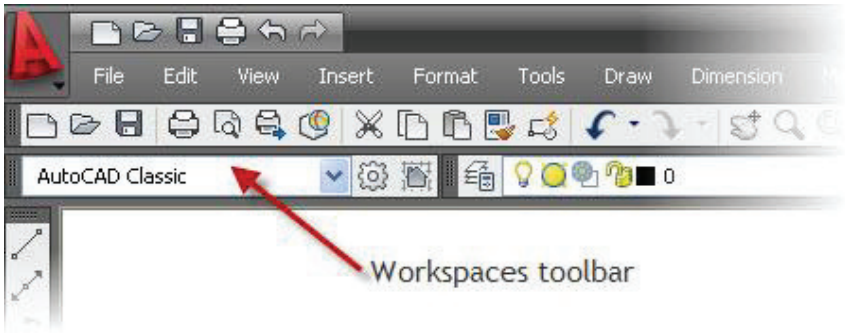
i. On the Windows task bar, click the Start button, then click All Programs. A menu of installed programs appears.

ii. Click the Autodesk folder → Next AutoCAD2013-English



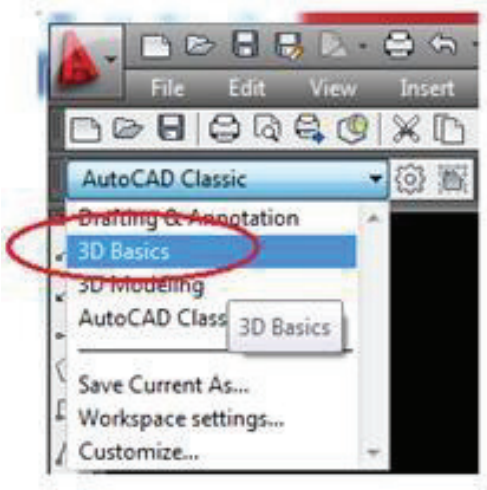
iii. AutoCAD opens and a new blank drawing appears.



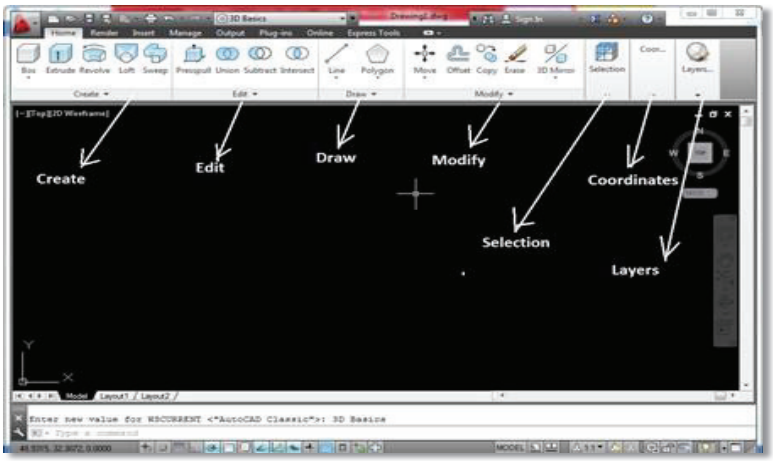


iv. Click the workspace switching drop down arrow or icon.

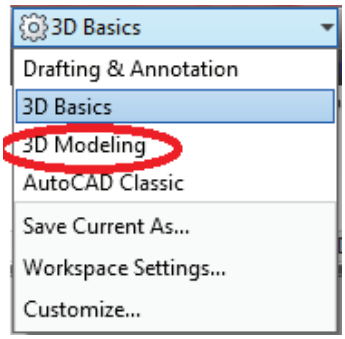
v. Click 3D Basic



vi. The following figure show3D Basic Ribbons.



vii. Or you can Click the 3D Modeling option.



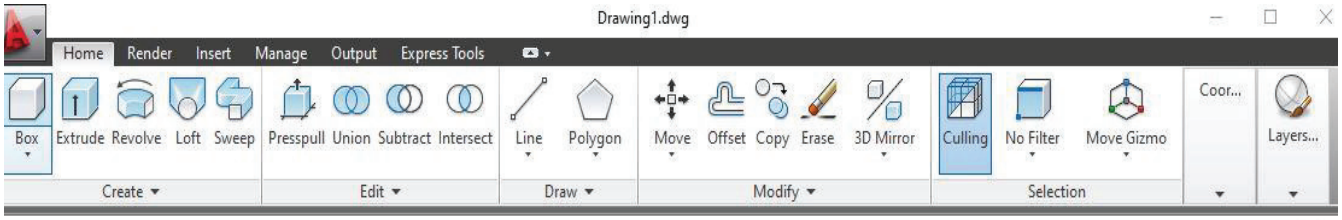
1.1.3. AutoCAD 3D Basic Ribbons

> **Remember**
>
> 3D Basics provides options to create basic 3D object.

For the 3D Basics options, there are following tabs for ribbons.

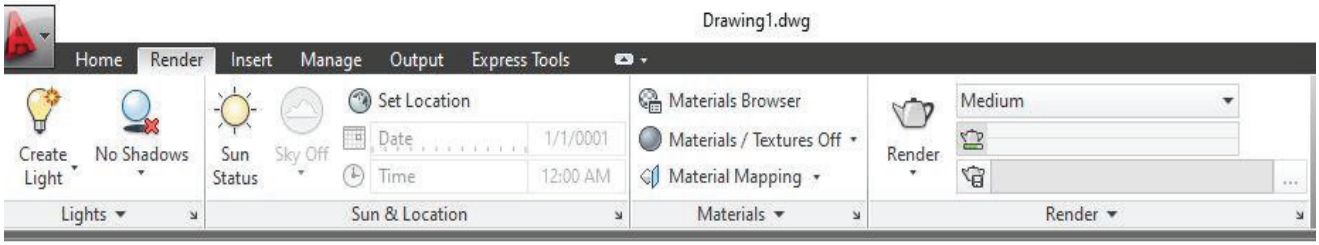
HOME, RENDER, INSERT, MANAGE, OUTPUT and EXPRESS TOOLS.

i. Home



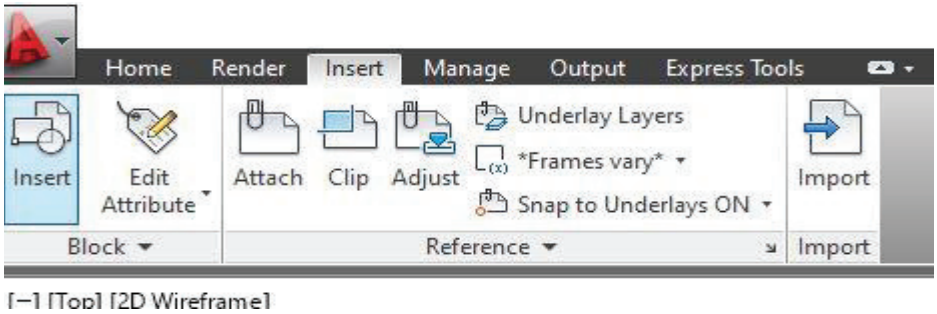
For the HOME tab, there are categories of Create, Edit, Draw, Modify, Selection, Coordinates and Layers & Views.

ii. Render:



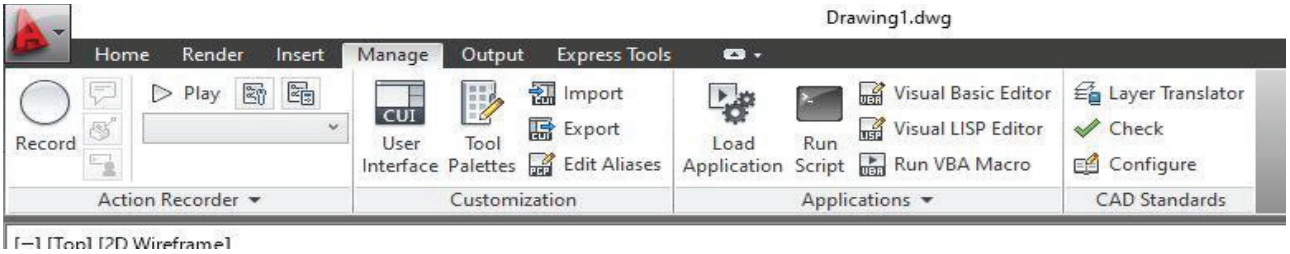
For the RENDER tab, there are categories of Lights, Sun & Location, Material, and Render.

iii. Insert



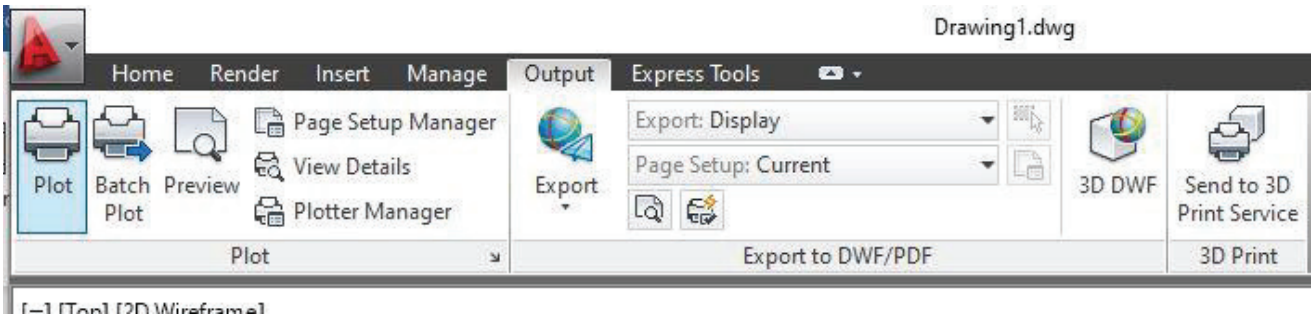
For the INSERT tab, there are categories of Block, Reference, and Import.

iv. Manage:



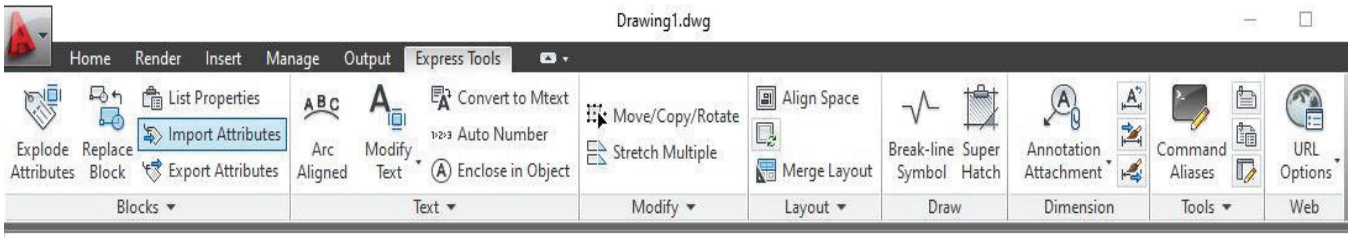
For the MANAGE tab, there are categories of Action Recorder, Customization, Applications, and CAD Standards.

v. Output



For the OUTPUT tab, there are categories of Plot, Export to DWF/ PDF, and 3D Print.

vi. Express Tools



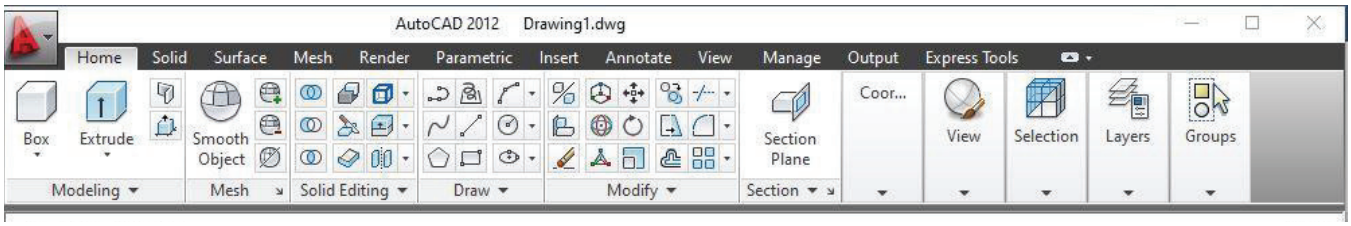
For the EXPRESS TOOLS tab, there are categories of Blocks, Text, Modify, Layout, Draw, Dimension, Tools and Web.

1.1.4. AutoCAD 3D Modeling Ribbons

For the 3D Modeling option, there are following tabs for ribbons.

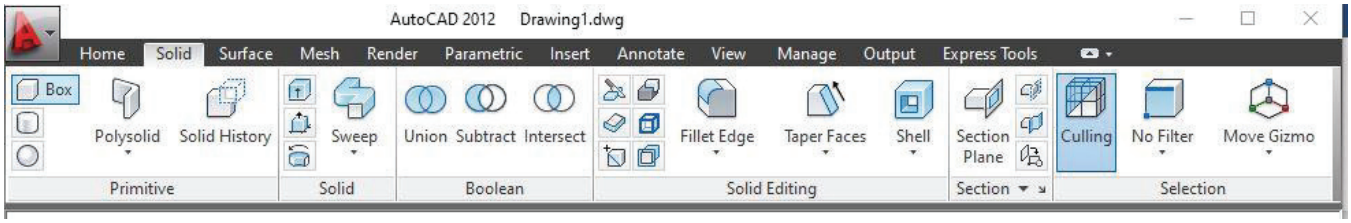
HOME, SOLID, SURFACE, MESH, RENDER, PARAMETRIC, INSERT, ANNOTATE, VIEW, MANAGE, OUTPUT and EXPRESS TOOLS.

i. Home



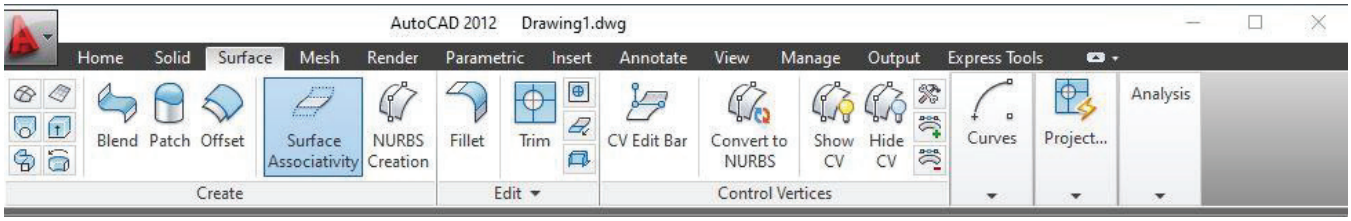
For the HOME tab, there are categories of Modeling, Mesh, Solid Editing, Draw, Modify, Section, Coordinates, View, Selection, Layers, and Groups.

ii. Solid



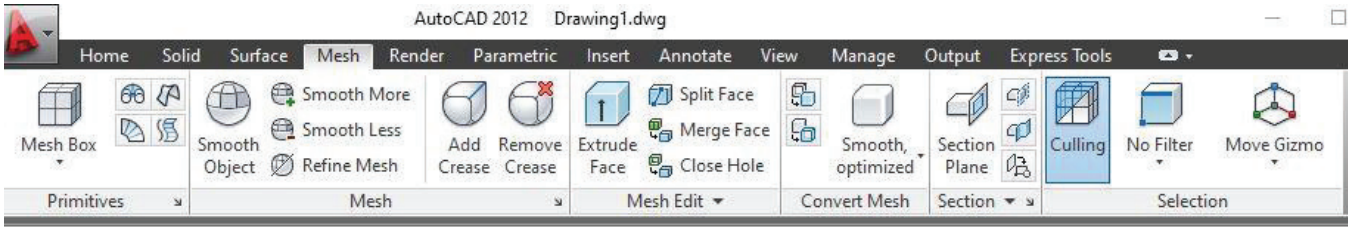
For the SOLID tab, there are categories of Primitive, Solid, Boolean, Solid Editing, Section, Selection.

iii. Surface



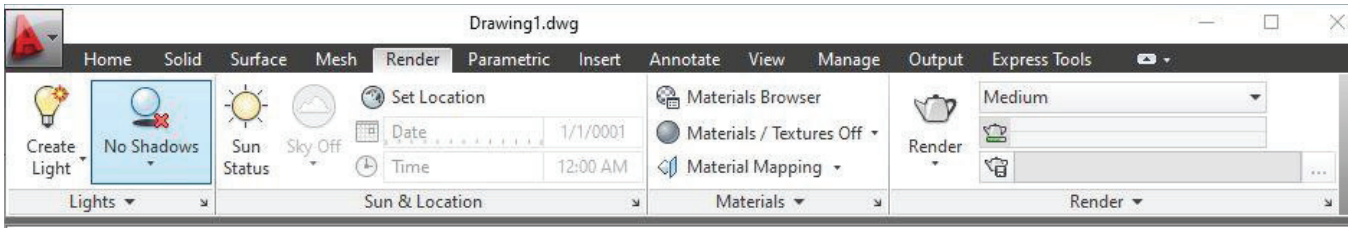
For the SURFACE tab, there are categories of Create, Edit, Control Vertices, Curves, Projections, Analysis.

iv. Mesh



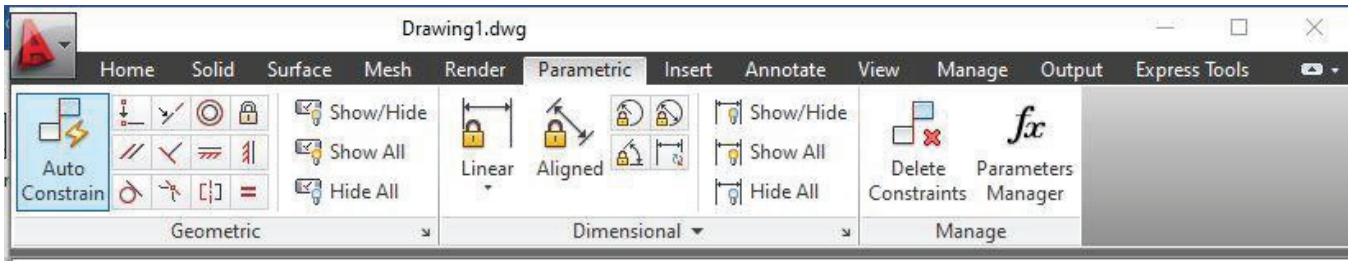
For the MESH tab, there are categories of Primitive, Mesh, Mesh Edit, Convert Mesh, Section and Selection.

v. Render



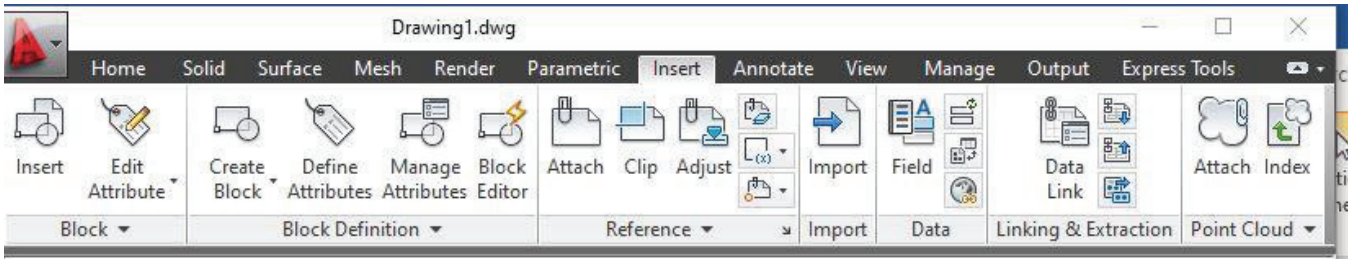
For the RENDER tab, there are categories of Lights, Sun & Location, Material, and Render.

vi. Parametric



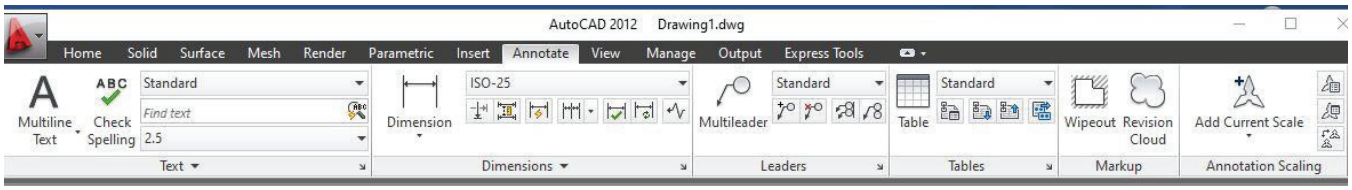
For the PARAMETRIC tab, there are categories of Geometric, Dimensional and Manage.

vii. Insert



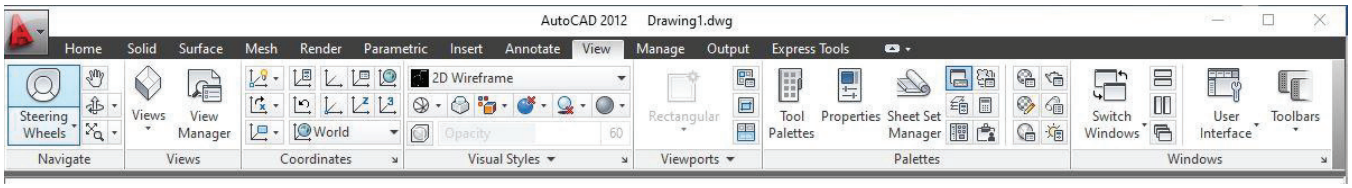
For the INSERT tab, there are categories of Block, Block Definition, Reference, Import, Data, Linking & Extraction, Point Cloud

viii. Annotate:



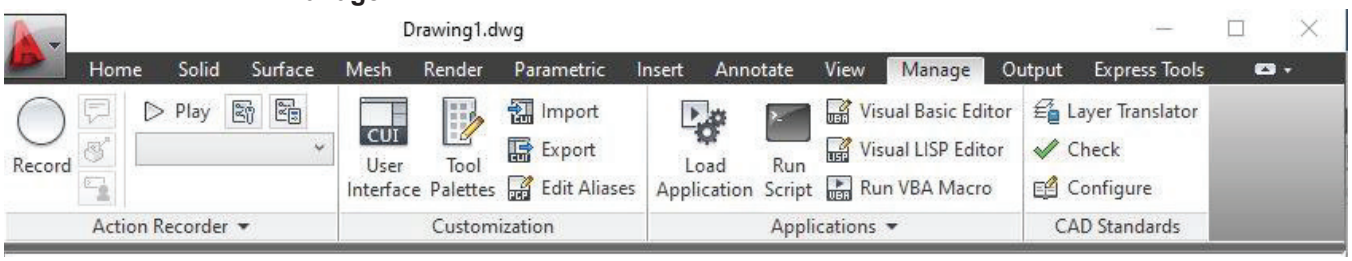
For the ANNOTATE tab, there are categories of Text, Dimensions, Leaders, Tables, Markup, Annotation Scaling.

ix. View:



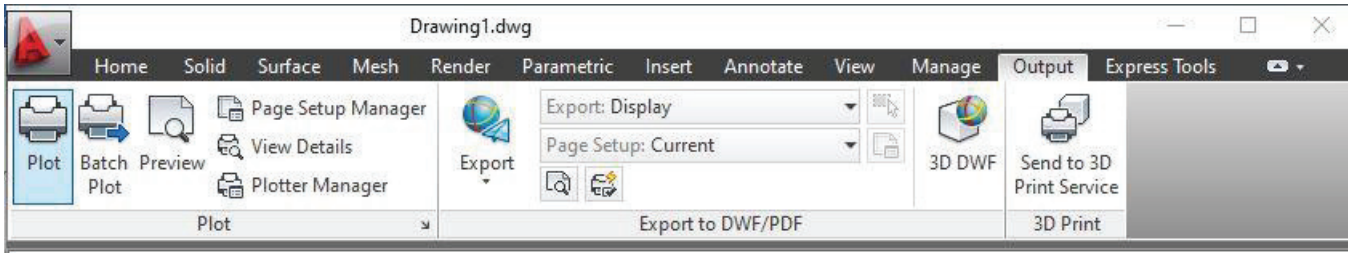
For the VIEW tab, there are categories of Navigate, Views, Coordinates, Visual Styles, Viewports, Palettes and Windows.

x. Manage:



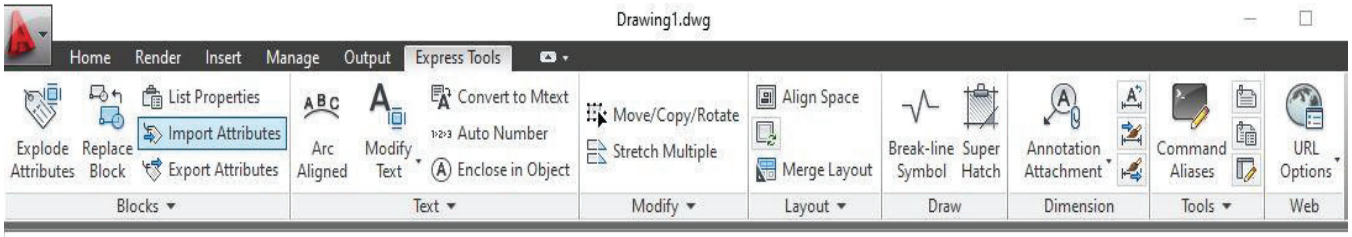
For the MANAGE tab, there are categories of Action Recorder, Customization, Applications, and CAD Standards.

xi. Output



For the OUTPUT tab, there are categories of Plot, Export to DWF/ PDF, and 3D Print.

xii. Express Tools

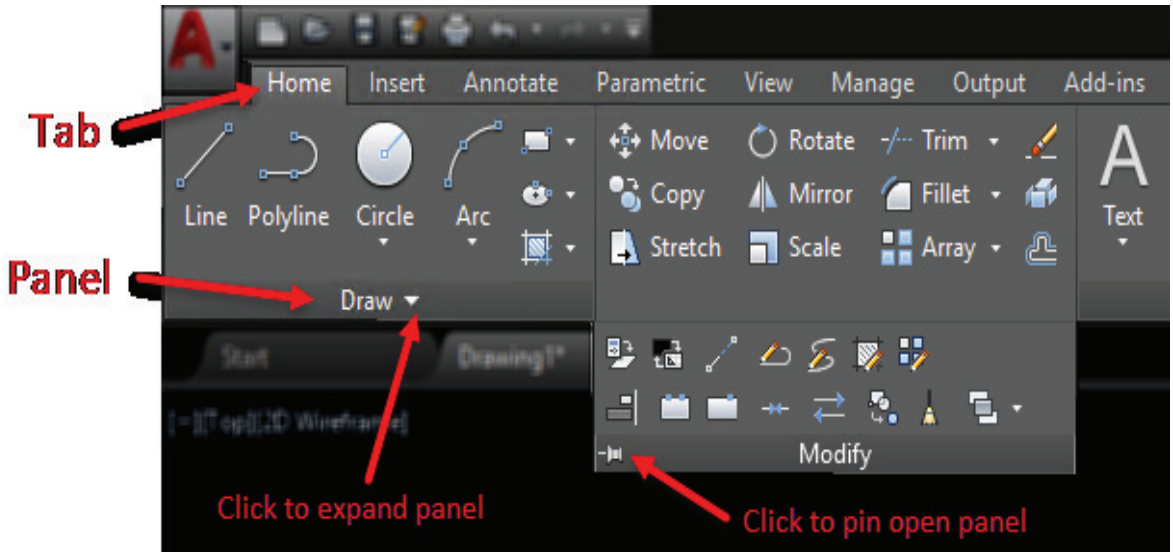


For the EXPRESS TOOLS tab, there are categories of Blocks, Text, Modify, Layout, Draw, Dimension, Tools and Web.

1.1.5. Prepare 3D interface including work space setting.

- **Ribbon:**

  The ribbon is a user interface tool that first appeared in AutoCAD 2018. It contains various commands organized into tabs and panels. It can be heavily customized by administrators and end users. Tabs are very powerful; they appear with panels of commands and options relating to whatever task is at hand for example, if a HATCH object is selected, a contextual tab with hatch editing command appears automatically.



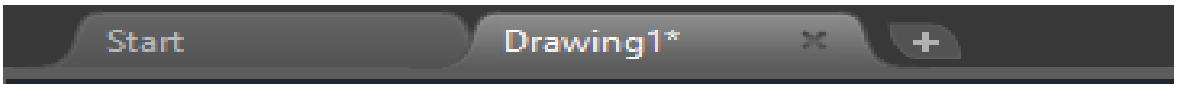
1.1.5.1. Status Bar:

Moving to the bottom of the application, you will find the Status Bar. Since AutoCAD 2015, the status bar contains icons only. By default, several icons are not enabled, so you might want to turn them on. We believe Autodesk does this because on a small monitor, all of the icons may not fit across on one row. But the icons will wrap up to a second row if needed, and on any decent sized monitor these days, at 1920×1080 resolution, you can enable all of the status bar icons and they fit with ease.

Below is a stock status bar, along with the control icon on the far right, expanded to show you the other available icons (Click on the image below for a full-size version)

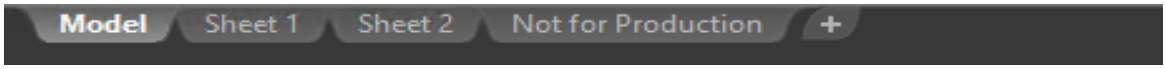
1.1.5.2. File Tabs:

File tabs provide access to all open documents in a minimal amount of space. Each open document has its own tab. Left-click on a tab to make it current, and right-click on a tab to access more options, such as Save and Close. There is always a tab containing a plus sign to open a new document using the QNEW command. By default, File Tabs are oriented at the top of the documents, below the Ribbon.



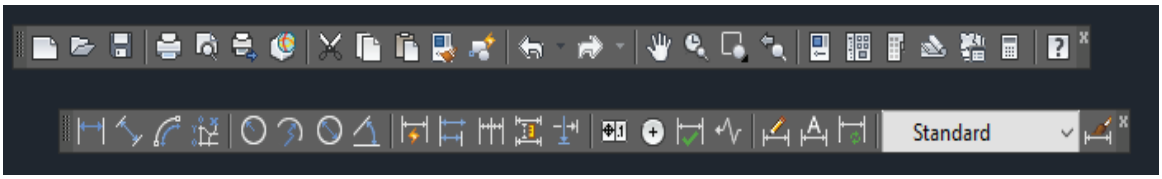
1.1.5.3. Layout Tabs: -

Layout tabs provide access to Model Space and each Layout in a given document. Left-click on a tab to make it current, and right-click on a tab to access more options such as Print, Move, or Rename. There is always a tab containing a plus sign for the creation of a new layout. By default, Layout Tabs are oriented at the bottom of the editor window in the status bar area.



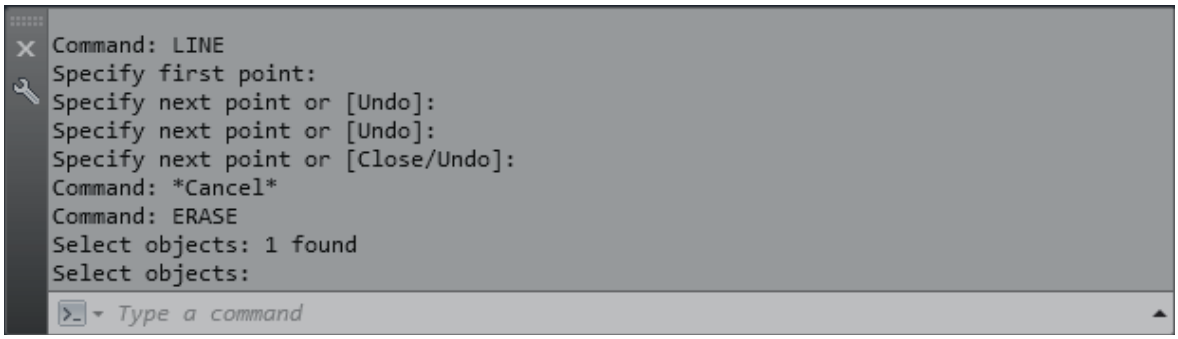
1.1.5.4. Toolbars: -

Toolbars go back to the early 1990's in AutoCAD. These are flat panels that contain buttons and or drop-down lists. Each button contains an icon. Toolbars can be floating or docked by own.



1.1.5.5. Command Line: -

The command line is a palette where you can type in command names and/or command responses, and the view the history of both. If the command line is docked, it has a fixed number of visible lines. Floating command line palettes can expand when needed to show you more data. The F2 key in both cases will toggle open/closed, a larger command line history window. A typical floating command line is shown here:



1.2. Setup 3D User Interface Settings for Required Specifications.

Save drawing and Activate all Tabs required for 3D to work with 3D modeling.

Important work after starting drawing.

We need following five steps to use before start of a drawing in Auto Cad Software.

These five steps are given bellow:

Remember

M.M stands for main menu

Open the Auto Cad
Set the unit and area
Z ➔ A/E
Set the primary unit
Save the file

1.2.1. Open the AutoCAD.

There are three methods to open the Auto Cad.

i. By Icon
ii. By Start Menu
iii. By Run

i. By Icon

Go to the desktop ➔ Double click on **Auto Cad** Software Icon.

ii. By Start Menu

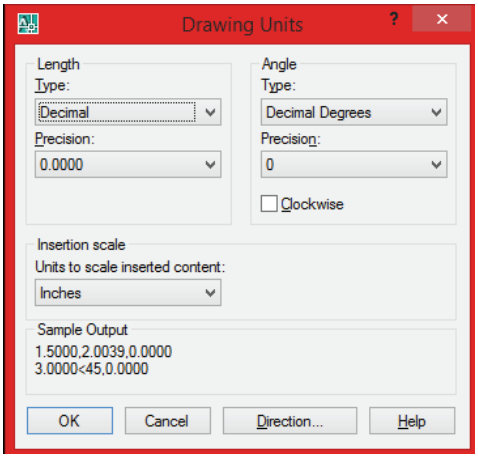
Go to start ➔ program ➔ Auto desk ➔ **Auto Cad**

iii. By Run

Go to Start ➔ Open the start window ➔ write the Auto Cad in Run Window ↙

1.2.2. Set the UNIT and AREA.

There are two methods to set the UNIT and AREA.



i. By Main Menu

ii. By dialog box

i. By Main Menu

UNIT

Short cut = UN

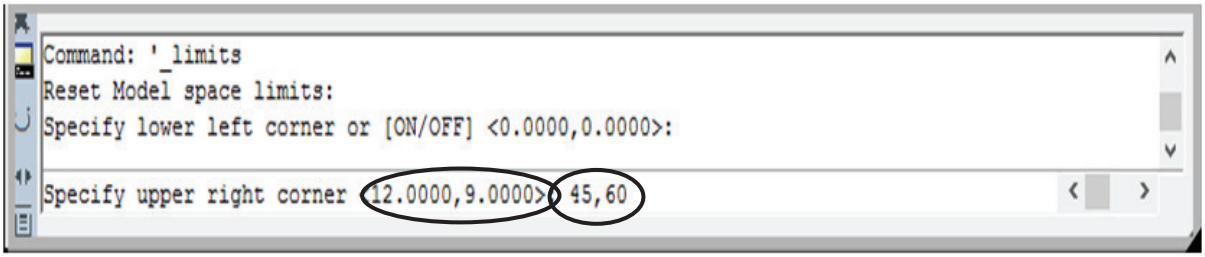
M.M ➔ Format ➔ Unit

➔ Open the unit window ➔ set the unit ➔ OK

AREA

Short cut = Limits

M.M ➔Format ➔drawing limits↙ ➔ Shoe the previous size of sheet in command area bar ➔ put the new sheet size in command area bar. (X, Y)



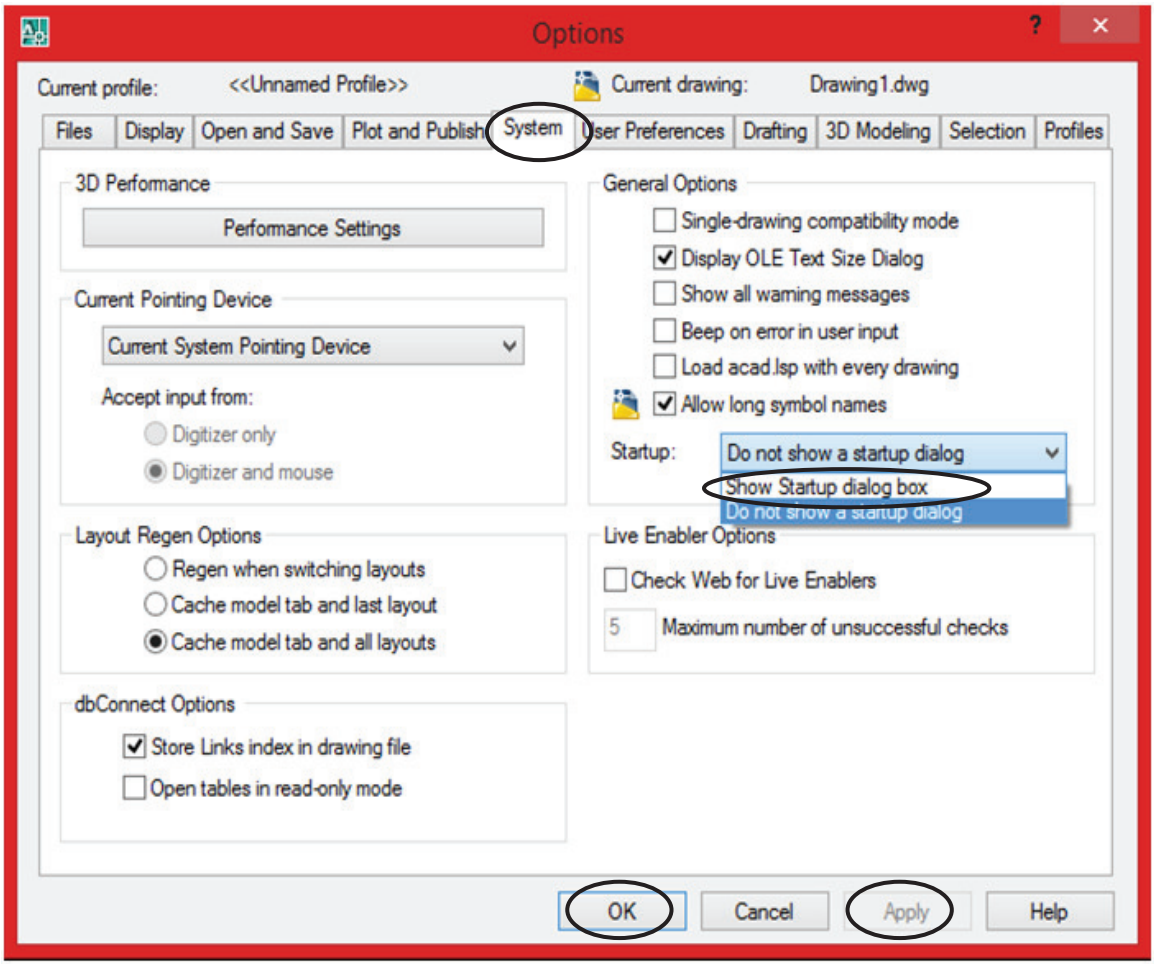
ii. Set the Units and Area by Dialog Box.

Fist Show the Startup Dialog Box in Drawing Area

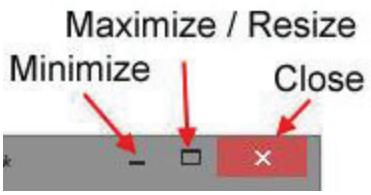
1.2.3. Method of Show the Startup Dialog Box.

i. Main Menu ➔ Tool ➔ Option ➔ Open the option Window ➔ System ➔

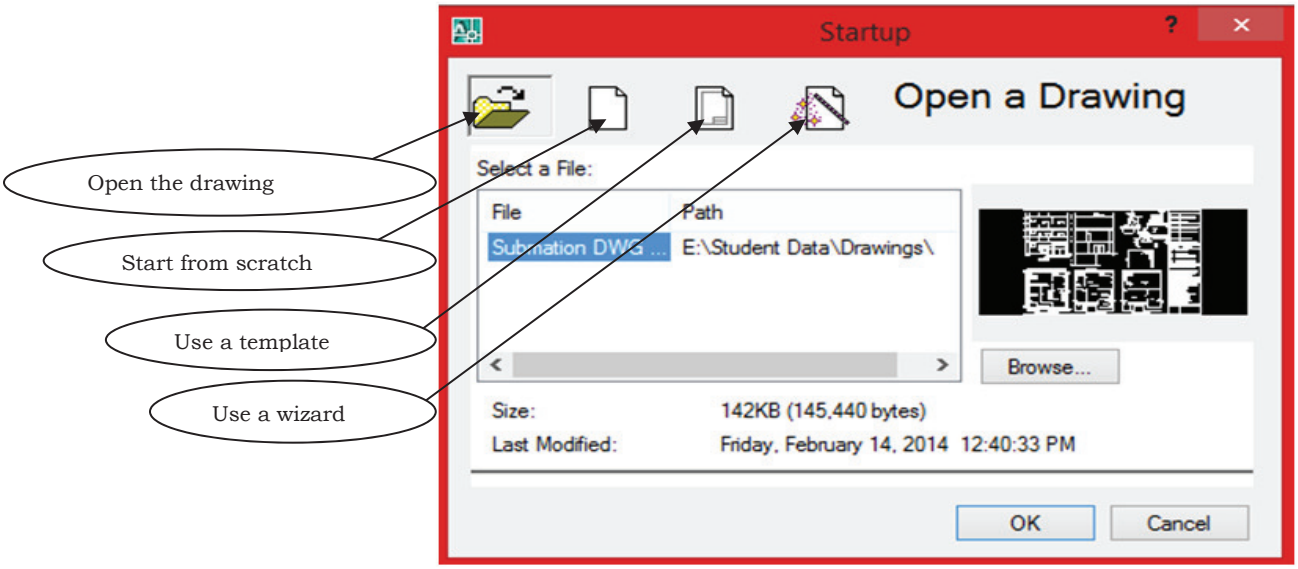
ii. Show the Startup Dialog ➔ Apply ➔ ok



iii. Close the Auto CAD and then Re-open the Auto CAD Software.



iv. Startup Dialog Box



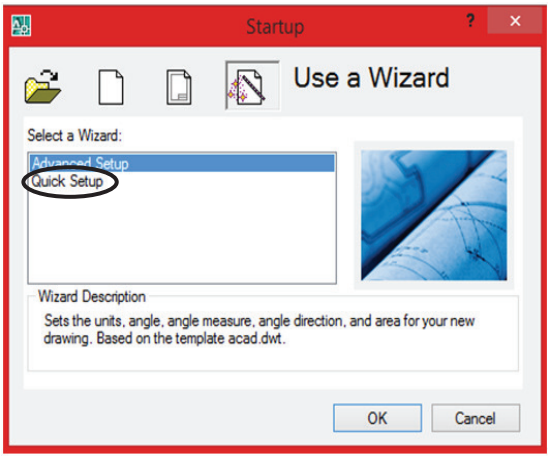
Go to use a wizard ➔ Quick setup

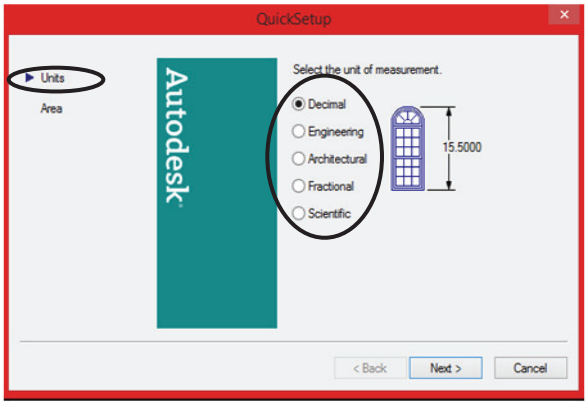
➔ OK ➔ Open quick setup window

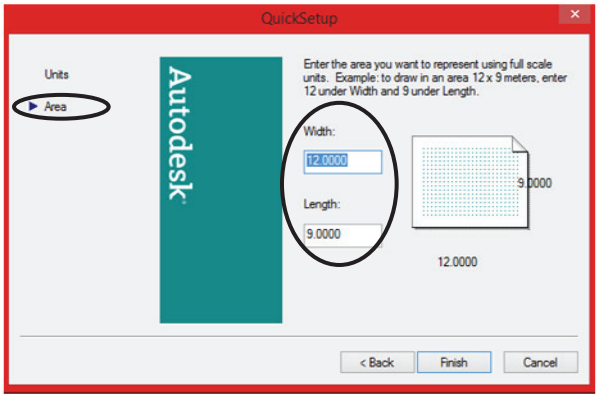
➔ set the **Unit** ➔ next

➔ set the **Area**

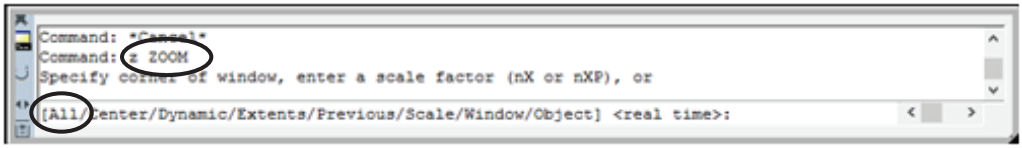
➔ Finish.





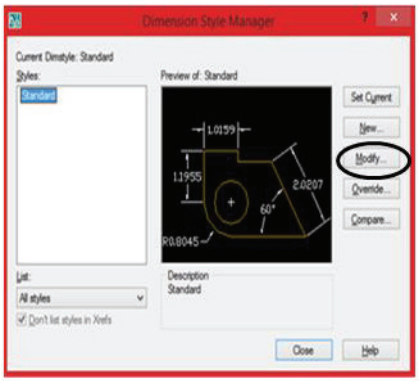


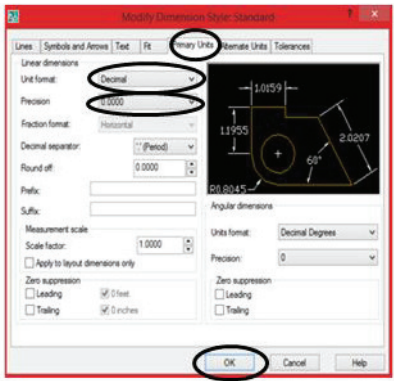
1.2.4. Z (Zoom)↙ ➔ A (All)/ E (Extend)



1.2.5. Set the Primary Unit

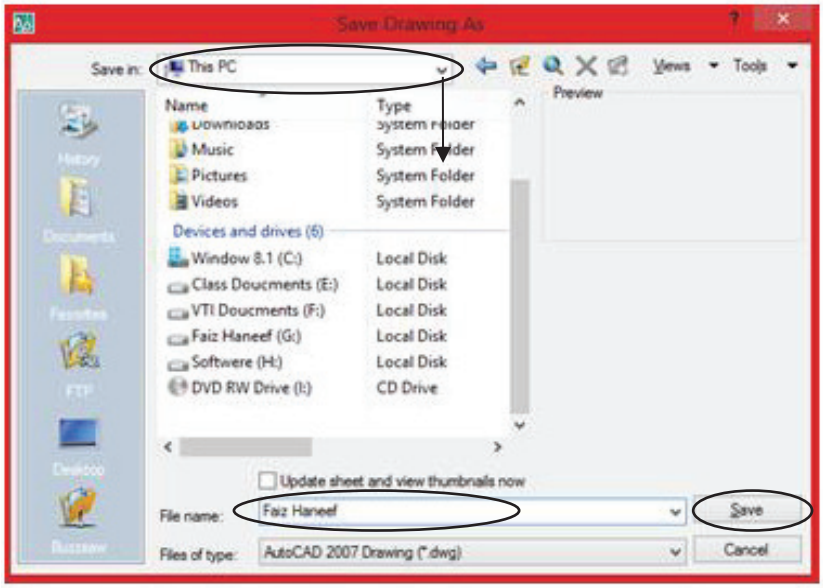
Short cut = D ↙
M.M ➔ Format ➔ Dimension style Manages ➔ Open the dimension style manager window ➔ Modify ➔ Open sub window ➔ Go to primary unit Tab ➔ set the primary unit ➔ set the precision ➔ OK ➔ Close.





1.2.6. Save the file.

Short cut = Ctrl+S
M.M ➔ File ➔ Save ➔ Open the Save window ➔ Select location ➔ Write the file Name ➔ Save



1.3. Create 3D Objects with Given Measurements

Execute 3D Commands in AutoCAD (3D solids, surfaces, meshes, and Wireframe objects, 3D face and Edges, etc.)

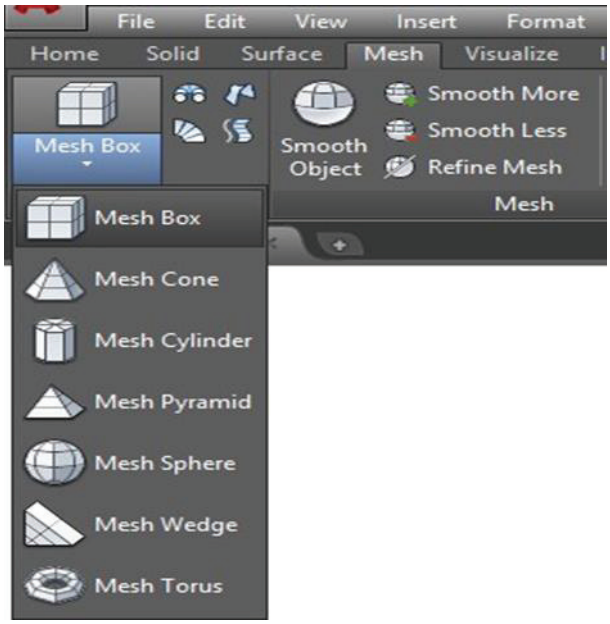
Remember

UCS stands for "user coordinate

1.3.1. Basic Mesh Command

The basic mesh forms, known as mesh primitives, are the equivalent of the primitive forms for 3D solids. You can reshape mesh objects by smoothing, creasing, refining, and splitting faces. You can also drag edges, faces, and vertices to mold the overall form.

Basic Mesh commands can be found out through
Ribbon drop down Menu



1.3.2. MESH BOX

Creates a rectangular or cubical mesh box. The base of the mesh box is drawn parallel to the XY plane of the current UCS (work plane).

Mesh Box command of 3D Surface can be find out through the following ways

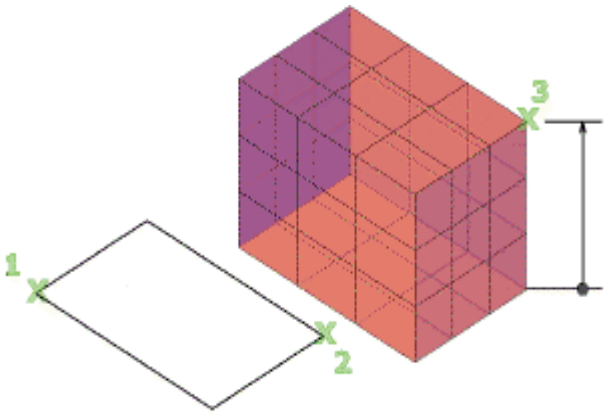
Through Short Cut Key: MESH enter → B enter

Application

Type MESH at the Command Prompt →[Box/Cone/Cylinder/Pyramid/Sphere/Wedge/Torus/Settings]
<Box>:→ B enter (for Box) → Specify Start point →Put the Value of @ X and Y Co-ordinate →Put the Value of height →enter

i. Mesh Box Options

ii. The Box option of the MESH command provides several methods for determining the size and rotation of the mesh boxes you create.



- **Cube**
- **Length**
- **Center Point**

- **Cube.**

  Use the Cube option to create a mesh box with sides of equal length

- **Length.**

  Use the Cube or Length option if you want to set the rotation of the box in the XY plane.

- **Center Point.**

  Use the Center option to create a box using a specified center point.

1.3.3. Mesh Cone

Create a 3D surface with a circular or elliptical base that tapers symmetrically to a point or to a circular or elliptical planar face. You can control the smoothness of 3D curved surface, such as a cone, in a shaded or hidden visual. Use the Top Radius option to create a cone frustum.

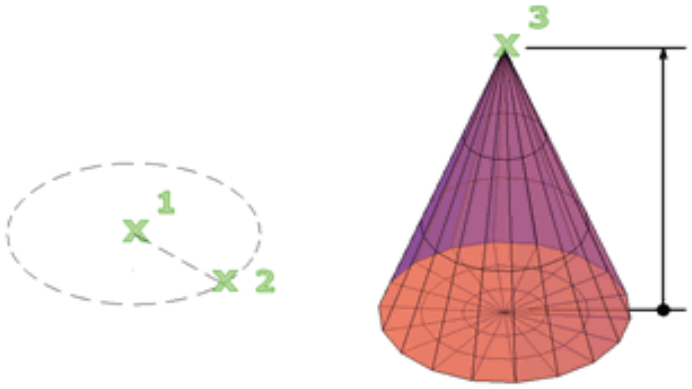
Through Short Cut Key MESH enter → C enter

Application

Type MESH at the Command Prompt →[Box/Cone/Cylinder/Pyramid/Sphere/Wedge/ Torus/SEttings] <Box>:→ C enter (for Cone)→ Specify center point of base →Put the base radius value →Put the Value of Height →enter

Mesh Cone Option

The Cone option of the MESH command provides several methods for determining the size and rotation of the mesh cones you create.



i. Center Point

ii. Axis Endpoint

iii. Frustum

iv. 3P

v. Elliptical

vi. TTR (Tangent, Tangent, Radius)

1.3.4. Cube

Specifies the center point of the Cone. When you specify the center point, the Cone is positioned so that its central axis is parallel to the Z axis of the current user coordinate system (UCS). Latitudinal lines are parallel to the XY plane.

i. **Radius** Defines the radius of the Cone.

ii. **Diameter** Defines the diameter of the Cone.

i. Axis Endpoint

Use the Axis End point option when you want to reorient the cone by placing the tip or axis endpoint anywhere in 3D space.

ii. Frustum

Use the Top Radius option to create a frustum of a cone, which tapers to an elliptical or planar face.

iii. 3P (Three Points)

The 3P (Three Points) option defines the size and plane of the base of the cone anywhere in 3D space

iv. Elliptical

Use the Elliptical option to create a cone base whose axes are of different lengths.

v. TTR (Tangent, Tangent, Radius)

Use the TTR (Tangent, Tangent, and Radius) option to define points on two objects. Depending on the radius distance, the new cone is located as near as possible to the tangent points you specify. You can set up tangency with circles, arcs, lines, and some 3D objects. The tangency points are projected into the current UCS. The appearance of tangency is affected by the current level of smoothness.

1.3.5. Mesh Cylinder: -

Creates a 3D surface with a circular or elliptical base that extends to the other circular or elliptical planar face. You can control the smoothness of curved 3D solids, such as a cylinder, in a shaded or hidden visual style with the FACETRES system variable.

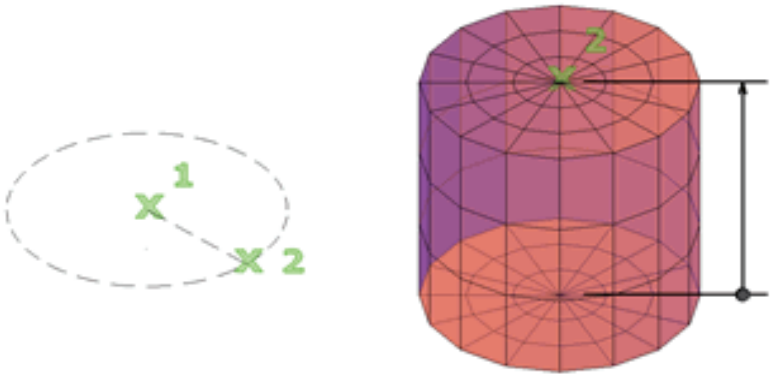
Remember

During a drawing session, the default value for the base radius is always as the previously entered base radius.

Through Short cut Key: MESH enter → CY enter

Application:

Type MESH at the Command Prompt →[Box/Cone/CYlinder/Pyramid/Sphere/Wedge/ Torus/Settings]<Box>:→CY enter (for Cylinder)→ Specify center point of base →Put the base radius value →Put the Value of Height →enter



- **Mesh Cylinder Options:**

  The Cylinder option of the MESH command provides several methods for determining the size and rotation of the mesh cylinders you create

  i. Axis Endpoint

  ii. 3P (Three Point

  iii. Elliptical

  iv. TTR (Tangent, Tangent, Radius)

i. Axis Endpoint

Use the Axis Endpoint option to set the height and rotation of the cylinder. The center point of the top plane of the cylinder is the axis endpoint, which can be located anywhere in 3D space.

ii. 3P (Three Points)

Use the 3P (Three Points) option to define the base of the cylinder. You can set three points anywhere in 3D space.

iii. Elliptical

Use the Elliptical option to create a cylinder base whose axes are of different lengths.

1.3.5.1. TTR (Tangent, Tangent, Radius)

Use the TTR (Tangent, Tangent, and Radius) option to define points on two objects. Depending on the radius distance, the new cylinder is located as near as possible to the tangent points you specify. You can set up tangency with circles, arcs, lines, and some 3D objects. The tangency points are projected onto the current UCS. The appearance of tangency is affected by the current level of smoothness.

1.3.6. Mesh Pyramid

By default, a pyramid is defined by the center of the base point, a point on the middle of the edge, and another point that determines the height. Initially, the default base radius is not set to any value. During a drawing session, the default value for the base radius is always the previously entered base radius value for any solid primitive.

Use the Top Radius option to create a pyramid frustum

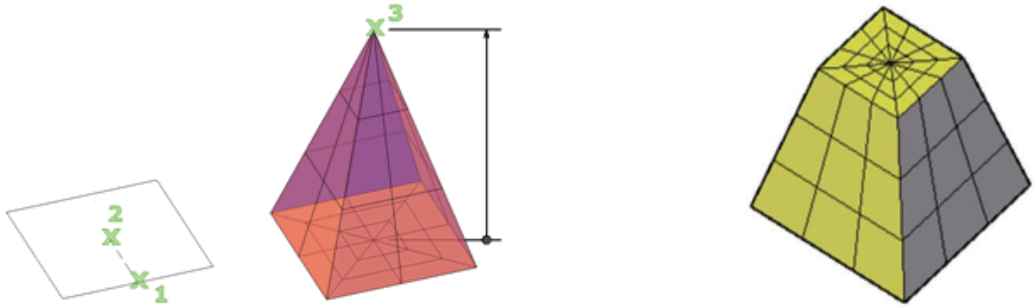
Through Short cut Key : MESH enter → P enter

APPLICATION

Type MESH at the Command Prompt →[Box/Cone/CYlinder/Pyramid/Sphere/Wedge/ Torus/SEttings] <Box>:→ Penter (for Pyramid)→ Specify center point of base→Put the base radius value→Put the Value of Height→enter

- **Mesh Pyramid Option**

  The Pyramid option of the MESH command provides several methods for determining the size and rotation of the mesh pyramids you create.



i. Sides

ii. Edges

iii. Frustum

iv. Axis Endpoint

v. Inscribed or circumscribed perimeter

i. Sides.

Use the Sides option to set the number of sides for the mesh pyramid.

ii. Edges.

Use the Edges option to specify the dimension of the sides at the base.

iii. Frustum

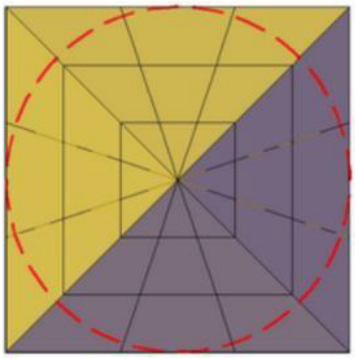
Use the Top Radius option to create a frustum, which tapers to a planar face. The frustum face is parallel to and has the same number of sides as, the base.

iv. Axis Endpoint

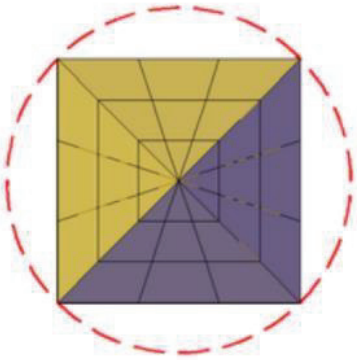
Use the Axis Endpoint option to specify the height and rotation of the pyramid. This endpoint is the top of the pyramid. The axis endpoint can be located anywhere in 3D space.

v. Inscribed or Circumscribed Perimeter.

Specify whether the pyramid base is drawn inside or outside of the radius.



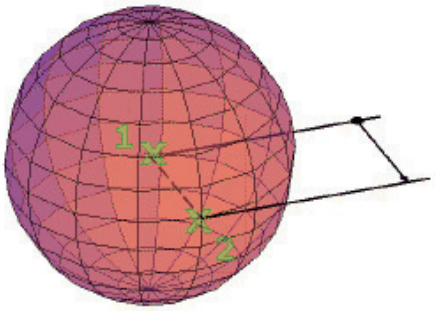
Circumscribed



Inscribed

1.3.7. Mesh Sphere

You can create a sphere by specifying a center point and a point on the radius. You can control the smoothness of curved 3D solids, such as a sphere, in a Shaded or hidden visual style with the FACETRES system variable.



Through Short Cut Key MESH enter → S enter

APPLICATION

Type MESH at the Command Prompt →[Box/Cone/CYlinder/ Pyramid/ Sphere/Wedge/Torus/SEttings] <Box>:→ S enter (for Sphere)→Specify center point →Put the radius value→enter

- **Mesh Sphere Option**
  - **i.** Center point
  - **ii.** 2p (Two Point)
  - **iii.** 3p (Three Point)
  - **iv.** TTR (Tangent, Tangent, Radius)

i. Center Point

Specifies the center point of the sphere. When you specify the center point, the sphere is positioned so that its central axis is parallel to the Z axis of the current user coordinate system (UCS). Latitudinal lines are parallel to the XY plane.

Radius	Defines the radius of the sphere.
Diameter	Defines the diameter of the sphere.

ii. 3P (Three Points)

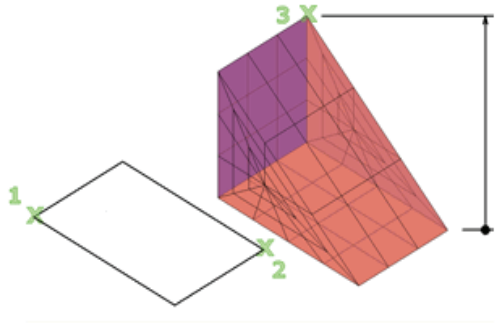
Defines the circumference of the sphere by specifying three points anywhere in 3D space. The three specified points also define the plane of the circumference.

iii. 2P (Two Points)

Defines the circumference of the sphere by specifying two points anywhere in 3D space. The plane of the circumference is defined by the Z value of the first point.

iv. TTR (Tangent, Tangent, Radius)

Defines the sphere with a specified radius tangent to two objects. The specified tangency points are projected onto the current UCS.



1.3.8. Mesh Wedge

Creates a mesh wedge with rectangular or cubical faces. The base of the wedge is drawn parallel to the XY plane of the current UCS with the sloped face opposite the first corner. The height of the wedge is parallel to the Z axis.

Through Short cut Key MESH enter → W enter

Application

Type MESH at the Command Prompt →[Box/Cone/CYlinder/ Pyramid/Sphere/Wedge/Torus/SEttings] <Box>:→ W enter (for Wedge)→ Specify Start point→Put the Value of @ X and Y Co-ordinate→Put the Value of Height→enter

- **Mesh Wedge Option**

  The Wedge option of the MESH command provides several methods for determining the size and rotation of the mesh wedges you create.

i. Center
ii. Cube
iii. Length
iv. 2 Point (With Height)

i. Center

Create the wedge by using a specified center point

ii. Cube

Set all edges of the mesh wedge base to be of equal length.

iii. Length

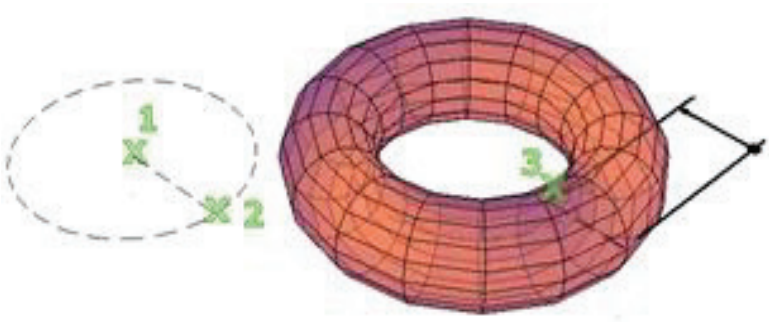
Creates a wedge with length, width, and height values you specify. The length corresponds to the X axis, the width to the Y axis, and the height to the Z axis. If you pick a point to specify the length, you also specify the rotation in the XY plane.

iv. 2 point (with Height)

Specifies that the height of the wedge is the distance between the two specified points.

1.3.9. Mesh Torus

Creates a ring-shaped surface that resembles the inner tube of a tire. A mesh torus has two radius values. One value defines the tube. The other value defines the path, which is equivalent to the distance from the center of the torus to the center of the tube. By default, a torus is drawn parallel to and is bisected by the XY plane of the current UCS.



A mesh torus can be self-intersecting. A self-intersecting mesh torus has no center hole because the radius of the tube is greater than the radius of the torus.

Through Short cut Key: MESH enter → T enter

APPLICATION

Type MESH at the Command Prompt →[Box/Cone/CYlinder/ Pyramid/Sphere/Wedge/Torus/SEttings] <Box>:→ T enter (for Torus)→ Specify center point →Put the radius value→Put the Tube radius Value →enterMesh Torus Option

The Torus option of the MESH command provides several methods for determining the size and rotation of the mesh tours you create.

i. 3P

ii. 2p

iii. TTR

iv. Radius

i. 3P (Three Points)

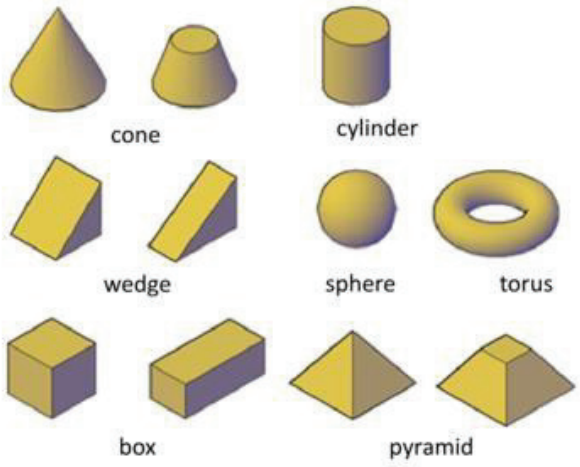
Use the 3P (Three Points) option to define the size of the mesh torus anywhere in 3D space. The three points also define the plane of the circumference. Use this option to rotate the mesh torus as you create it.

ii. 2P (Two Points)

Use the 2P (Two Points) option to define the size of the mesh torus anywhere in 3D space. The plane of the circumference matches the Z value of the first point.

iii. TTR (Tangent, Tangent, Radius)

Use the TTR (Tangent, Tangent, and Radius) option to define points on two objects. Depending on the specified radius distance, the path of the torus is located as near as possible to the tangent points you specify. You can set up tangency with circles, arcs, lines, and some 3D objects. The tangency points are projected into the current UCS. The appearance of tangency is affected by the current level of smoothness.



iv. Radius

Defines the radius of the torus: the distance from the center of the torus to the center of the tube. A negative radius creates a solid shaped like an American football.

Solid Primitive Commands

The basic solid forms, known as solid primitives, are the equivalent of the primitive forms for 3D solids.

You can create several basic 3D shapes, known as solid primitives: boxes, cones, cylinders, spheres, wedges, pyramids, and torus (donuts).

By combining primitive shapes, you can create more complex solids. For example, you can join two solids, subtract one from the other, or create a shape based on the intersection of their volumes.

1.3.10. Solid Primitives

Solid primitives can easily be drawn from the Home Tab & Solid Tab

i. Box
ii. Cone
iii. Cylinder
iv. Pyramid
v. Sphere
vi. Wedge
vii. Tours

1.3.10.1. Box

The base of the box is always drawn parallel to the XY plane of the current UCS (work plane). The height of the box is specified in the Z-axis direction. You can enter both positive and negative values for the height.

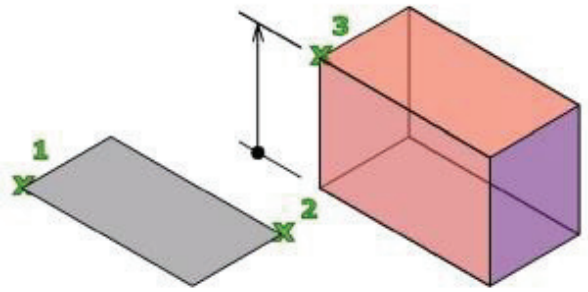
Through Short Cut Key →BOX enter

Application

Type **Box** at the Command Prompt →Specify Start point→Put the Value of @ X and Y Co-ordinate→ Put the value of height →enter

- **Box Options**

Use the following options to control the size and rotation of the boxes you create:



i. Cube

ii. Length

iii. Center Point

i. Cube

Use the Cube option of the BOX command to create a box with sides of equal length.

ii. Length

Create a box with length, width, and height values you specify. If you enter values, the length corresponds to the X axis, the width to the Y axis, and the height to the Z axis. If you pick a point to specify the length, you also specify the rotation in the XY plane.

iii. Center point.

Use the Center option to create a box using a specified center point.

1.3.10.2. Cone

Create a 3D solid with a circular or elliptical base that tapers symmetrically to a point or to a circular or elliptical planar face. You can control the smoothness of 3D curved solids, such as a cone, in a shaded or hidden visual style with the FACETRES system variable.

Use the Top Radius option to create a cone frustum.

Initially, the default base radius is not set to any value. During a drawing session, the default value for the base radius is always the previously entered base radius value for any solid primitive.

Through Short Cut Key → Cone enter

Application

Type **Cone** at the Command Prompt → Specify center point of base→put the base radius value→Put the Value of Height→enter

- **Cone Option**

Use the following options to control the size and rotation of the cones you create.

i. Center Point

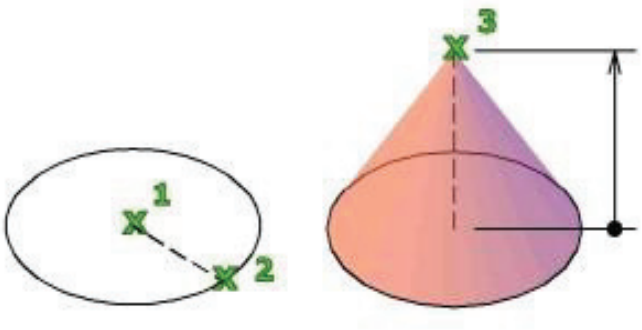
ii. Axis Endpoint

iii. Frustum

iv. 3P

v. Elliptical

vi. TTR (Tangent, Tangent, Radius)



i. Center Point

When you specify the center point, the Cone is positioned so that its central axis is parallel to the Z axis of the current user coordinate system (UCS). Latitudinal lines are parallel to the XY plane.

ii. Axis Endpoint

Use the Axis Endpoint option when you want to reorient the cone by placing the tip or axis endpoint anywhere in 3D space.

iii. Frustum

Use the Top Radius option to create a frustum of a cone, which tapers to an elliptical or planar face.

iv. 3P (Three Points)

The 3P (Three Points) option defines the size and plane of the base of the cone anywhere in 3D space.

v. Elliptical

Use the Elliptical option to create a cone base whose axes are of different lengths.

vi. TTR (Tangent, Tangent, Radius)

Use the TTR (Tangent, Tangent, and Radius) option to define points on two objects. Depending on the radius distance, the new cone is located as near as possible to the tangent points you specify. You can set up tangency with circles, arcs, lines, and some 3D objects. The tangency points are projected into the current UCS. The appearance of tangency is affected by the current level of smoothness.

1.3.10.3. Cylinder

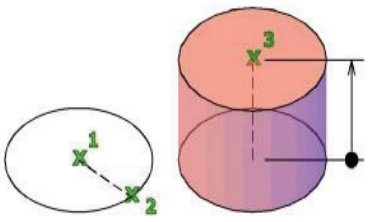
In the illustration, the cylinder was created using a center point (1), a point on the radius (2), and a point for the height (3). The base of the cylinder is always on a plane parallel with the work plane. You can control the smoothness of curved 3D solids, such as a cylinder, in a shaded or hidden visual style with the FACETRES system variable.

Through Short Cut Key → Cylinder enter

Application

Type Cyl at the Command Prompt → Specify center point of base→put the base radius value→Put the Value of Height →enter

- **Cylinder Options**



i. Axis Endpoint
ii. 3P (Three Point
iii. Elliptical
iv. TTR (Tangent, Tangent, Radius)

i. Axis End point

Use the Axis Endpoint option to set the height and rotation of the cylinder. The center point of the top plane of the cylinder is the axis endpoint, which can be locate anywhere in 3D space.

ii. 3P (Three Points)

Use the 3P (Three Points) option to define the base of the cylinder. You can set three points anywhere in 3D space.

iii. Elliptical

Use the Elliptical option to create a cylinder base whose axes are of different lengths.

iv. TTR (Tangent, Tangent, Radius)

Use the TTR (Tangent, Tangent, and Radius) option to define points on two objects. Depending on the radius distance, the new cylinder is located as near as possible to the tangent points you specify. You can set up tangency with circles, arcs, lines, and some 3D objects. The tangency points are projected onto the current UCS.

1.3.10.4. Pyramid

By default, a pyramid is defined by the center of the base point, a point on the middle of the edge, and another point that determines the height. Initially, the default base radius is not set to any value. During a drawing session, the default value for the base radius is always the previously entered base radius value for any solid primitive.

Use the Top Radius option to create a pyramid frustum.

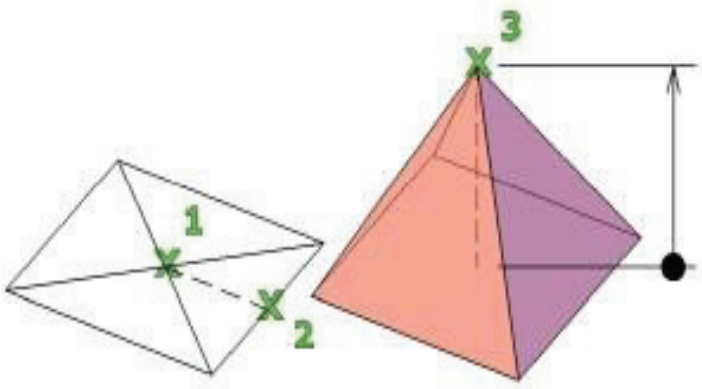
Through Short Cut Key → Pyr enter

Application

Type Pyr at the Command Prompt → Specify center point of base→put the base radius value→Put the Value of Height→enter

- **Pyramid Option**

The Pyramid option provides several methods for determining the size and rotation of the pyramids you create.



i. Sides

ii. Edges

iii. Frustum

iv. Axis Endpoint

v. Inscribed or circumscribed perimeter

i. Sides

Use the Sides option to set the number of sides for the pyramid.

ii. Edges.

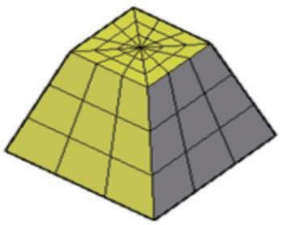
Use the Edges option to specify the dimension of the sides at the base.

iii. Frustum

Use the Top Radius option to create a frustum, which tapers to a planar face. The frustum face is parallel to and has the same number of sides as, the base.

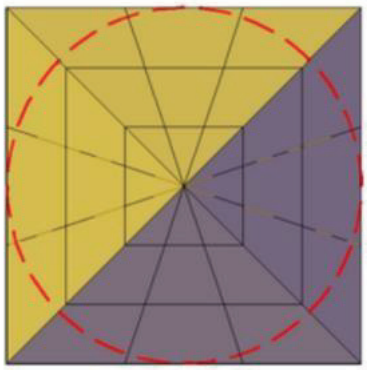
iv. Axis Endpoint

Use the Axis Endpoint option to specify the height and rotation of the pyramid. This endpoint is the top of the pyramid. The axis endpoint can be located anywhere in 3D space.

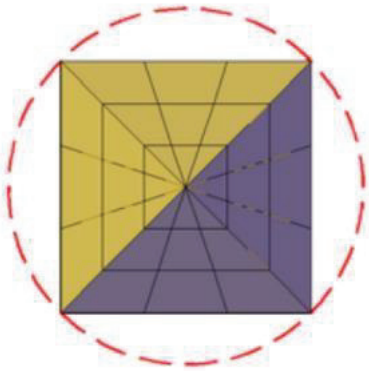


v. Inscribed or circumscribed perimeter.

Specify whether the pyramid base is drawn inside or outside of the radius



Circumscribed



Inscribed

1.3.10.5. Sphere

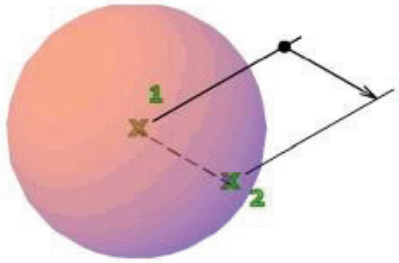
You can create a torus by specifying the center, then the radius or diameter of the torus, and then the radius or diameter of the tube that surrounds the torus. You can control the smoothness of curved 3D solids, such as a torus, in a shaded or hidden visual style with the FACETRES system variable.

Through Short Cut Key → Sphere enter

Application

Type Sphere at the Command Prompt →Specify center point →Put the radius value→enter

- **Sphere Option**



Use the following options to draw a sphere with the SPHERE command:

i. Center point
ii. 2p (Two Point)
iii. 3p (Three Point)
iv. TTR(Tangent, Tangent, Radius)

i. Center Point

Specify the center point of the sphere. When you specify the center point, the sphere is positioned so that its central axis is parallel to the Z axis of the current user coordinate system (UCS). Latitudinal lines are parallel to the XY plane.

Radius Defines the radius of the sphere.

Diameter Defines the diameter of the sphere.

ii. 2P (Two Points)

Define the circumference of the sphere by specifying two points anywhere in 3D space. The plane of the circumference is defined by the Z value of the first point.

iii. 3P (Three Points)

Define the circumference of the sphere by specifying three points anywhere in 3D space. The three specified points also define the plane of the circumference.

iv. TTR (Tangent, Tangent, Radius)

Define the sphere with a specified radius tangent to two objects. The specified tangency points are projected onto the current UCS.

1.3.10.6. Wedge

The direction of the taper is always in the positive X-axis direction of the UCS. Entering a positive value draws the height along the positive Z axis of the current UCS. Entering a negative value draws the height along the negative Z axis

Through Short Cut Key → Wedge enter

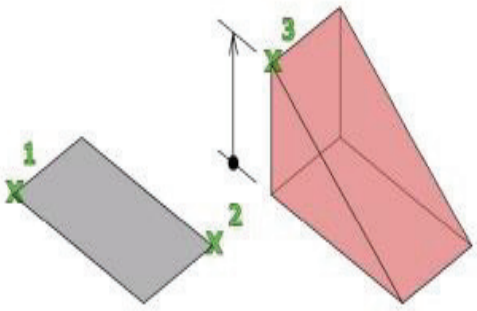
Application

Type Wedge at the Command Prompt □Specify Start point □Put the Value of @ X and Y Co-ordinate □Put the Value of Height □enter

- **Wedge Option**

The Wedge option provides several methods for determining the size and rotation of the wedges you create.

i. Center
ii. Cube
iii. Length
iv. 2pints with weight)



i. Center

Create the wedge by using a specified center point.

ii. Cube

Set all edges of the mesh wedge base to be of equal length.

iii. Length

Create a wedge with length, width, and height values you specify. The length corresponds to the X axis, the width to the Y axis, and the height to the Z axis. If you pick a point to specify the length, you also specify the rotation in the XY plane.

iv. 2 point (with Height)

Specify that the height of the wedge is the distance between the two specified points.

1.3.10.7. Torus

You can create a torus by specifying the center, then the radius or diameter of the torus, and then the radius or diameter of the tube that surrounds the torus. You can control the smoothness of curved 3D solids, such as a torus, in a shaded or hidden visual style with the FACETRES system variable.

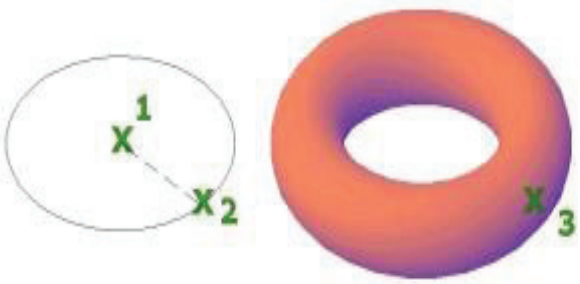
Through Short Cut Key → Tor enter

Application

Type Tor at the Command Prompt → Specify center point of Torus→Put the radius value of Torus →Put the Tube radius Value →enter

- **Torus Option**

The Torus option provides several methods for Determining the size and rotation of the mesh tours you create.



3P

i. 2p

ii. TTR

iii. Radius

i. 3P (Three Points)

Use the 3P (Three Points) option to define the size of the torus anywhere in 3D space. The three points also define the plane of the circumference. Use this option to rotate the torus as you create it.

ii. 2P (Two Points)

Use the 2P (Two Points) option to define the size of the torus anywhere in 3D space. The plane of the circumference matches the Z value of the first point.

iii. TTR (Tangent, Tangent, Radius)

Use the TTR (Tangent, Tangent, and Radius) option to define points on two objects. Depending on the specified radius distance, the path of the torus is located as near as possible to the tangent points you specify. You can set up tangency with circles, arcs, lines, and some 3D objects. The tangency points are projected into the current UCS.

iv. Radius

Define the radius of the torus: the distance from the center of the torus to the center of the tube. A negative radius creates a solid shaped like an American football.

1.3.11. Poly Solid Command

You can create walls with straight and curved segments of constant height and width. With the POLYSOLID command, you can convert an existing line, 2D polyline, arc, or circle to a solid with a rectangular profile. A polysolid can have curved segments, but the profile is always rectangular by default. You can draw a solid with POLYSOLID just as you would a polyline. The PSOLWIDTH system variable sets the default width for the solid. The PSOLHEIGHT system variable sets the default height for the solid.

Through Short Cut Key → Ploysoild enter

Application

Type polysolid at the Command Prompt → Specify start point or [Object/Height/Width/Justify] <Object>→Specify next point or [Arc/Undo]→ Specify next point or [Arc/Undo] →enter

- **POLY SOLID OPTIONS**

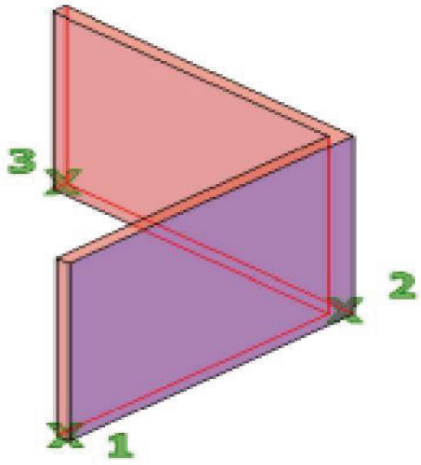
  Use the following options to control the size and shape of the polysolid you create.

i. Object

ii. Height

iii. Width

iv. Justify



i. Object

Specify an object to convert to a solid. You can convert:

a. Line
b. Arc
c. 2D polyline
d. Circle

i. Height

Specify the height of the solid

ii. Width

Specify the width of the solid.

iii. Justify

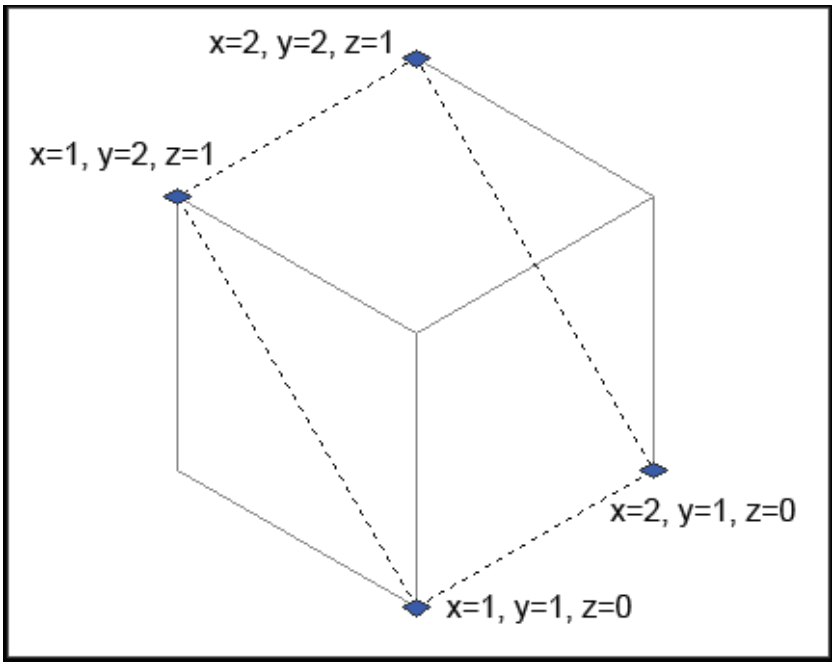
Set the width and height as the solid to be left, right, or center justified when defining the profile with the command. The justification is based on the starting direction of the first segment of the profile.

1.3.12. Wireframes

A wireframe model is a skeletal description of a 3D object. There are no surfaces in a wireframe model; it consists only of points, lines, and curves that describe the edges of the object. With AutoCAD you can create wireframe models by positioning 2D objects anywhere in 3D space.

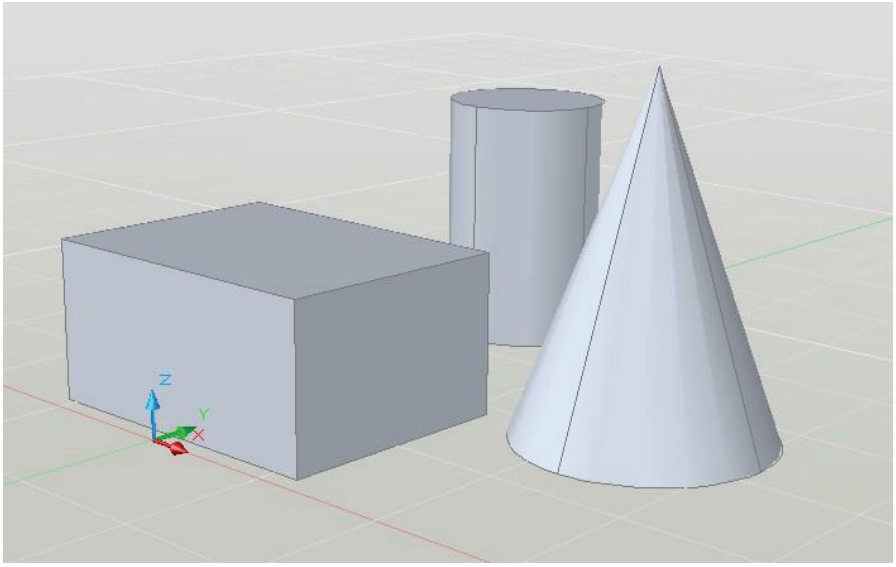
AutoCAD also provides some 3D wireframe objects, such as 3D polylines (that can only have a CONTINUOUS linetype) and splines. Because each object that makes up a wireframe model must be independently drawn and positioned, this type of modeling can be the most time-consuming.

Wireframe lines in 3D



1.3.13. Solids

Solid modeling is the easiest type of 3D modeling to use. With the AutoCAD solid modeler, you can make 3D objects by creating basic 3D shapes: boxes, cones, cylinders, spheres, wedges, and tori (do- nuts). You can then combine these shapes to create more complex solids by joining or subtracting them or finding their intersecting (over- lapping) volume. You can also create solids by sweeping a 2D object along a path or revolving it about an axis.



1.3.13.1. 2D Solid

Creates solid-filled triangles and quadrilaterals.

Type SOLID at the command prompt.

Command: **SOLID**

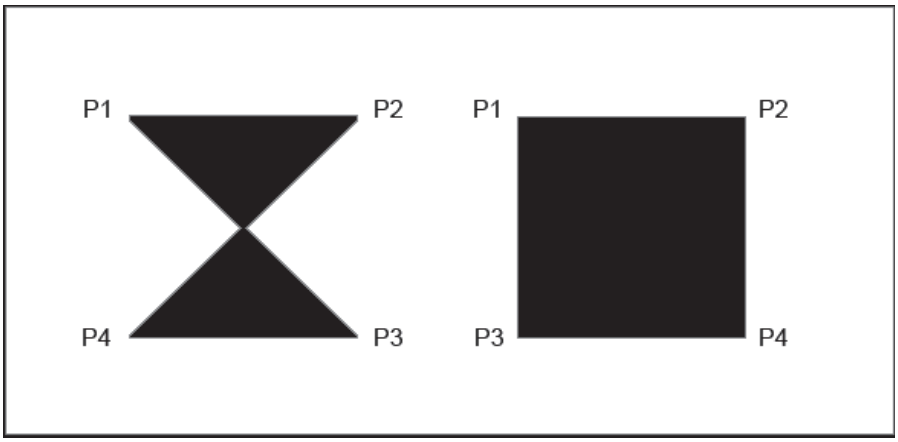
First point: **P1**

Second point: **P2**

Third point: **P3**

Fourth point: **P4**

Third point: **enter**



1.3.14. 3D Faces

3DFACE creates a three or four sided surface anywhere in 3D space. You can specify different Z coordinates for each corner point of a 3D face.
3DFACE differs from SOLID, which creates a three- or four-sided surface that is parallel to the current UCS and can be extruded.

i. Begin a new drawing.

ii. Set the visual style to Conceptual.

iii. Type 3DFACE at the command prompt.

Command: **3DFACE**

First point: pick

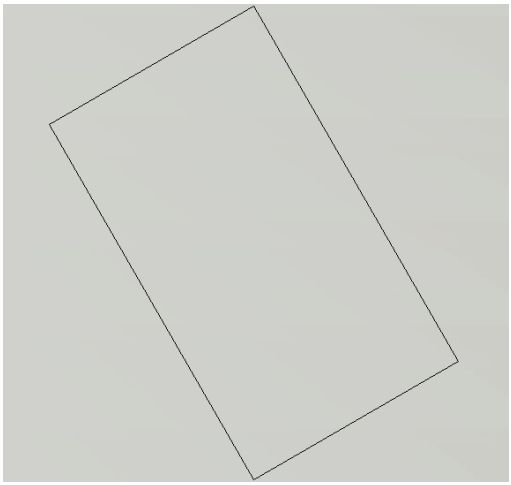
Second point: pick

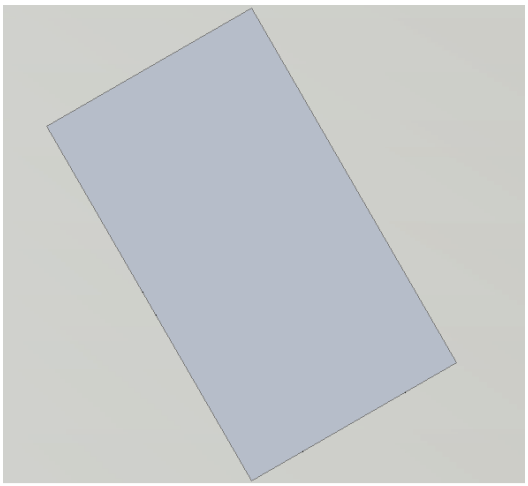
Third point: pick

Fourth point: pick

Third point: enter

3D Wireframe Lines 3D faces





1.3.14.1. 3D Face Invisible Edge

With 3DFACE, you control which edges of a 3D face are visible, allowing accurate modeling of objects with holes. Entering i or invisible before the first point of an edge makes the edge invisible.Type 3DFACE at the command prompt.

i. Draw an irregular shaped object similar to the one **shown below.**

ii. Set the visual style to Conceptual.

iii. Type 3DFACE at the command prompt.

Command: **3DFACE**

First point: P1

Second point: P2

Third point: i P3

Fourth point: P4

Third point: i P5

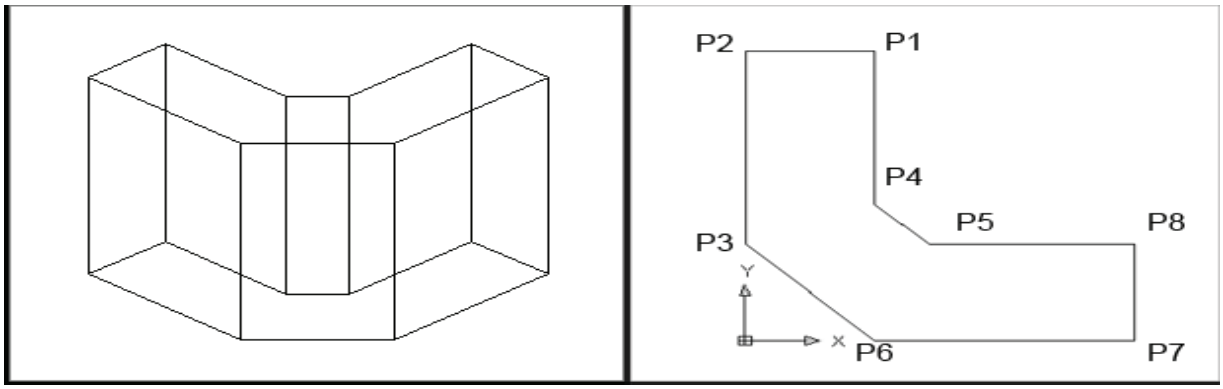
Fourth point: P6

Third point: P7

Fourth point: P8

Third point: enter

NOTE: You must enter an “i” for invisible before the face is chosen.

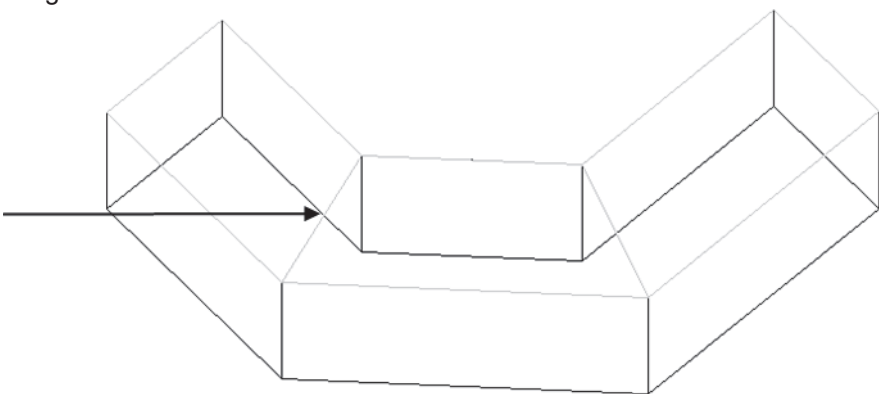


1.3.15. Edge Command

i. Type EDGE at the command prompt.

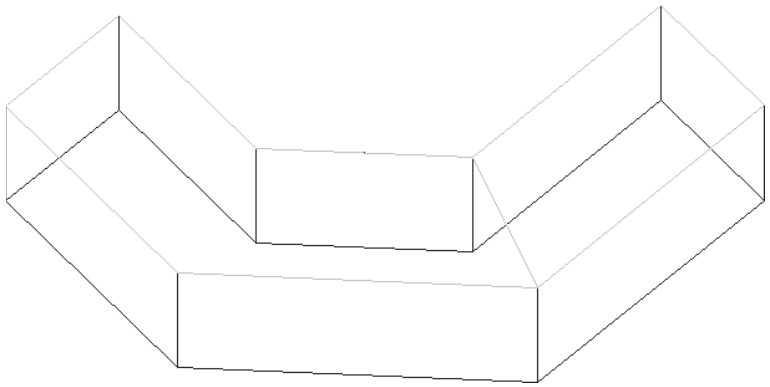
Command: **EDGE**

Specify edge of 3dface to toggle visibility or [Display]:
pick edge



Pick edge

Specify edge of 3dface to toggle visibility or [Display]: **D**
Enter selection method for display of hidden edges [Select/All] <All>: **A**
** Regenerating 3DFACE objects...done.
Specify edge of 3dface to toggle visibility or [Display]: **press enter**



PFace

Creates a three-dimensional polyface mesh vertex by vertex

i. Type PFACE at the command prompt.

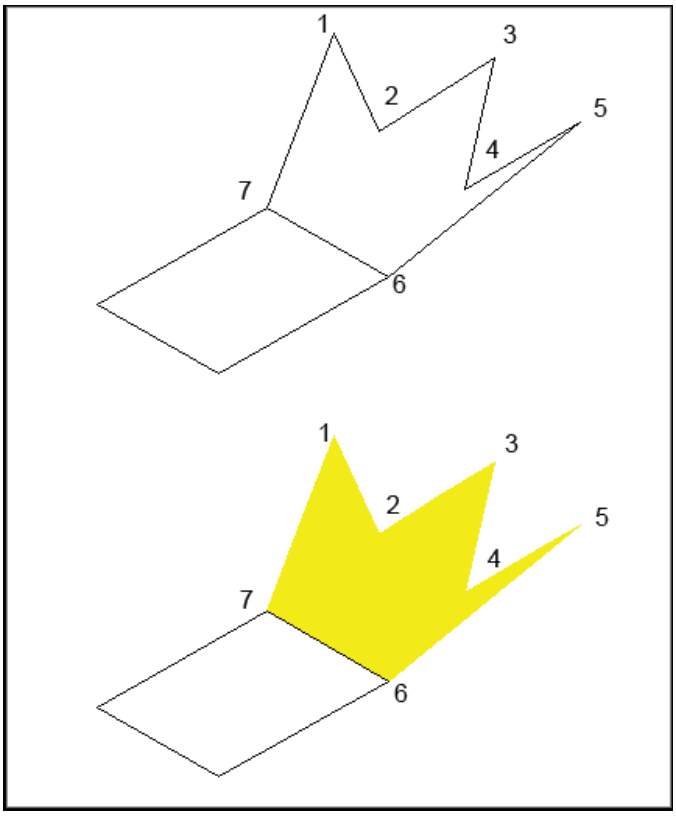
Command: **PFACE**

Specify location for vertex 1: **pick point 1**

Specify location for vertex 2 or <define faces>: **pick point 2** Specify location for vertex 3 or <define faces>: **pick point 3** Specify location for vertex 4 or <define faces>: **pick point 4** Specify location for vertex 5 or <define faces>: **pick point 5** Specify location for vertex 6 or <define faces>: **pick point 6** Specify location for vertex 7 or <define faces>: **pick point 7** Specify location for vertex 8 or <define faces>: **enter**

Face 1, vertex 1:
Enter a vertex number or [Color/Layer]: **1 (enter)**
Face 1, vertex 2:
Enter a vertex number or [Color/Layer] <next face>: **2 (enter)**
Face 1, vertex 3:
Enter a vertex number or [Color/Layer] <next face>: **6 (enter)**
Face 1, vertex 4:
Enter a vertex number or [Color/Layer] <next face>: **7 (enter)**
Face 1, vertex 5: **enter**
Enter a vertex number or [Color/Layer] <next face>: Face 2, vertex 1:
Enter a vertex number or [Color/Layer]: **2 (enter)**
Face 2, vertex 2:
Enter a vertex number or [Color/Layer] <next face>: **3 (enter)**
Face 2, vertex 3:
Enter a vertex number or [Color/Layer] <next face>: **4 (enter)**
Face 2, vertex 4:
Enter a vertex number or [Color/Layer] <next face>: **6 (enter)**
Face 2, vertex 5:
Enter a vertex number or [Color/Layer] <next face>: Face 3, vertex 1:
Enter a vertex number or [Color/Layer]: **4 (enter)**
Face 3, vertex 2:
Enter a vertex number or [Color/Layer] <next face>: **5 (enter)**
Face 3, vertex 3:

Enter a vertex number or [Color/Layer] <next face>: **6 (enter)**
Face 3, vertex 4:
Enter a vertex number or [Color/Layer] <next face>: Face 4, vertex 1: **enter**
Enter a vertex number or [Color/Layer]:



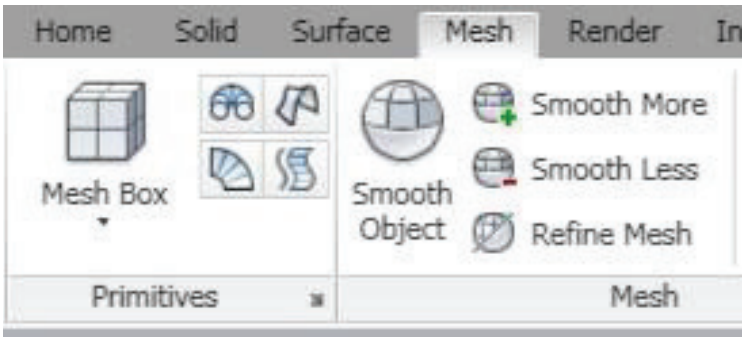
Basic Mesh Commands

i. Click the 3D Modeling dropdown option from the Solids panel.

ii. Click the Mesh tab.

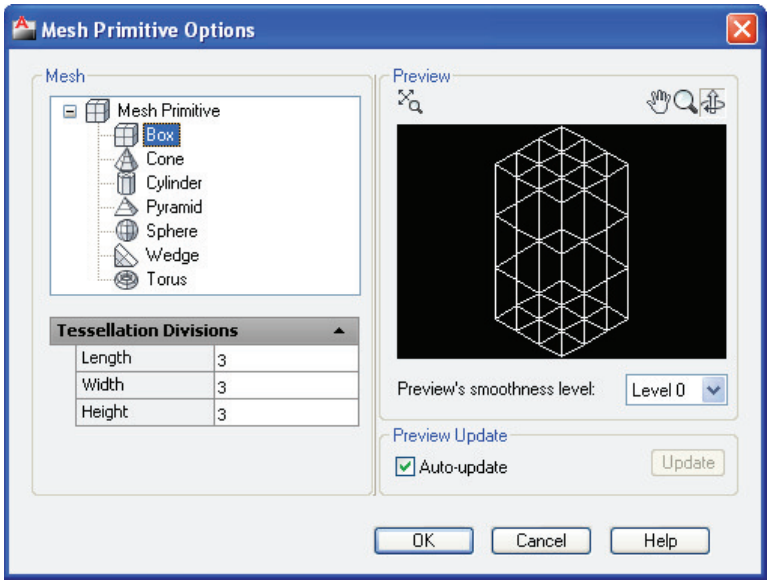
iii. Click the Primitives panel.

iv. Click the Primitive drop-down.



Mesh Primitive Options

The following settings can be adjusted for mesh primitives.



1.3.15.1. Mesh Box

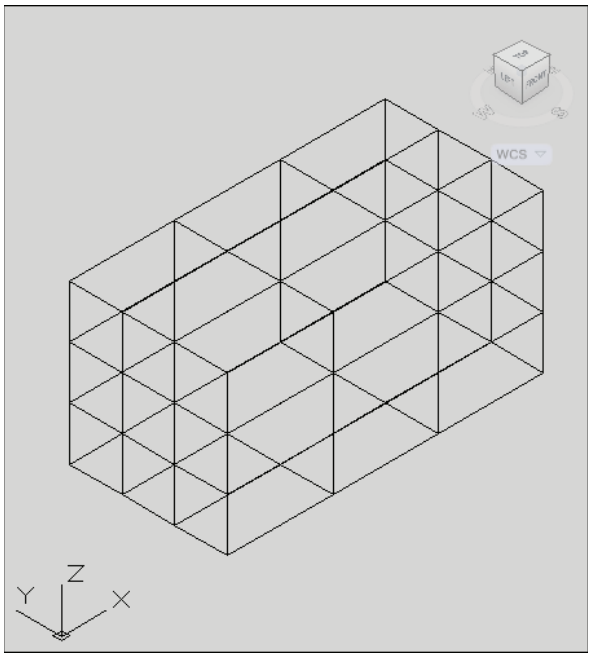
Choose Mesh box from the Primitives panel.

Command: **MESH**

Current smoothness level is set to : 0 Enter an option

[Box/Cone/CYlinder/Pyramid/Sphere/Wedge/Torus/ SEttings] <Box>: **_BOX**

Specify first corner or [Center]: pick point Specify other corner or [Cube/Length]: **@4,2** Specify height or [2Point] <3.0000>: **2**



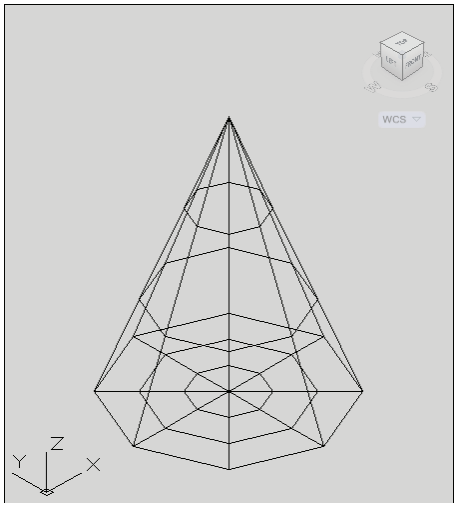
1.3.15.2. Mesh Cone

Choose Mesh cone from the Primitives panel. Command: **MESH**

Current smoothness level is set to : 0 Enter an option

[Box/Cone/CYlinder/Pyramid/Sphere/Wedge/Torus/S Ettings] <C one>: **CONE**

Specify center point of base or [3P/2P/Ttr/Elliptical]: Specify base radius or [Diameter] <1.5074>: **2** Specify height or [2Point/Axis endpoint/Top radius] <2.0000>: **5**



1.3.15.3. Mesh Cylinder

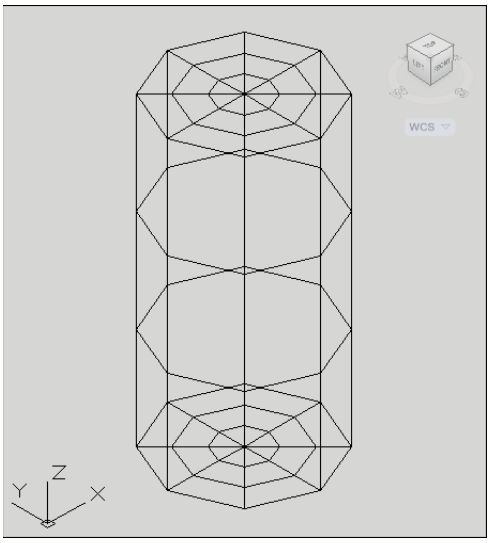
Choose Mesh cylinder from the Primitives panel. Command: MESH

Current smoothness level is set to : 0 Enter an option

[Box/Cone/CYlinder/Pyramid/Sphere/Wedge/Torus/ SEttings]

<Cylinder>: **CYLINDER**

Specify center point of base or [3P/2P/Ttr/Elliptical]: Specify base radius or [Diameter] <2.0000>: **2** Specify height or [2Point/Axis endpoint] <5.0000>: **8**



1.3.15.4. Mesh Pyramid

Choose Mesh pyramid from the Primitives panel.

Command: **MESH**

Current smoothness level is set to : 0 Enter an option

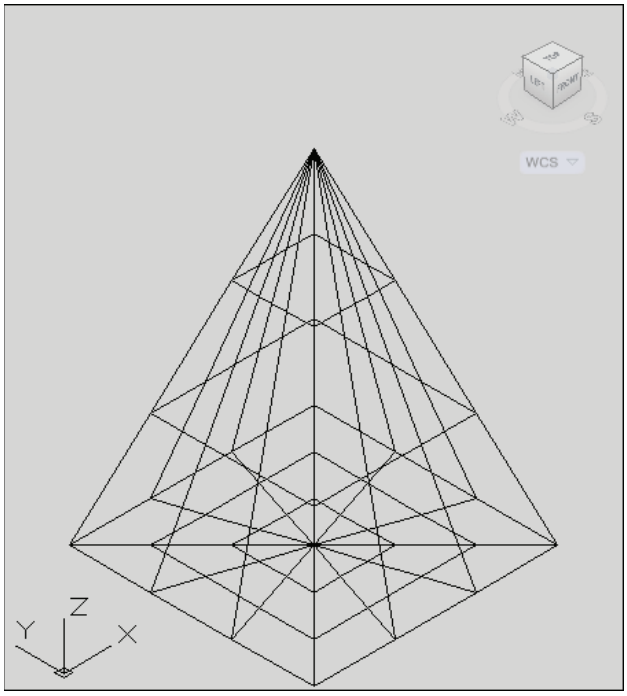
[Box/Cone/CYlinder/Pyramid/Sphere/Wedge/Torus/S Ettings]

<Pyramid>: **PYRAMID**

4 sides Circumscribed

Specify center point of base or [Edge/Sides]: Specify base radius or [Inscribed] <2.0000>: Specify height or [2Point/Axis endpoint/Top radius]

<8.0000>: **4**



1.3.15.5. Mesh Sphere

Choose Mesh sphere from the Primitives panel.

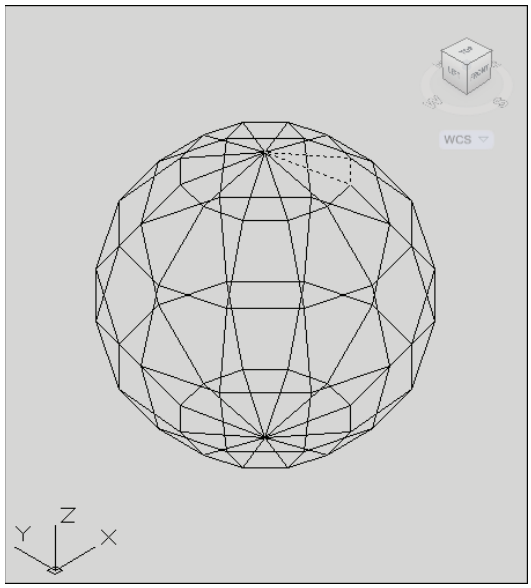
Command: **MESH**

Current smoothness level is set to : 0 Enter an option

[Box/Cone/CYlinder/Pyramid/Sphere/Wedge/Torus/S Ettings]

<Pyramid>: **SPHERE**

Specify center point or [3P/2P/Ttr]: Specify radius or [Diameter] <2.0000>:



1.3.15.6. Mesh Wedge

Choose Mesh wedge from the Primitives panel.

Command: **MESH**

Current smoothness level is set to : 0 Enter an option

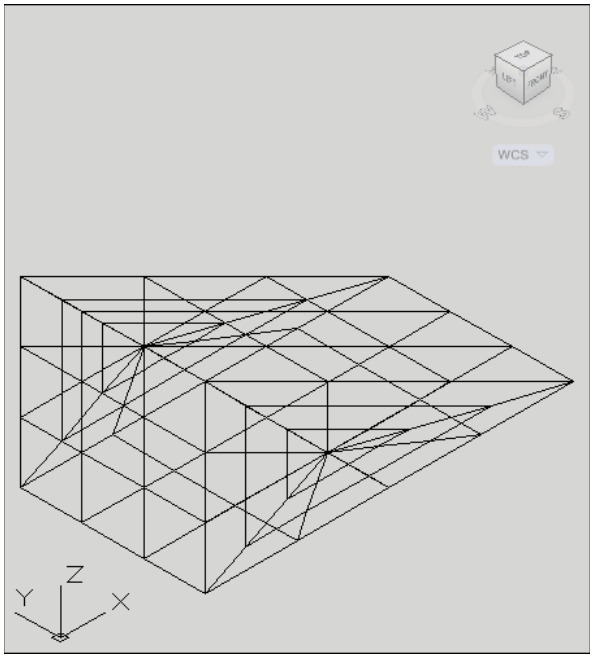
[Box/Cone/CYlinder/Pyramid/Sphere/Wedge/Torus/S Ettings]

<Wedge>: **WEDGE**

Specify first corner or [Center]:

Specify other corner or [Cube/Length]: **@4,2**

Specify height or [2Point] <4.0000>: **2**



1.3.15.7. Mesh Torus

Choose Mesh torus from the Primitives panel.

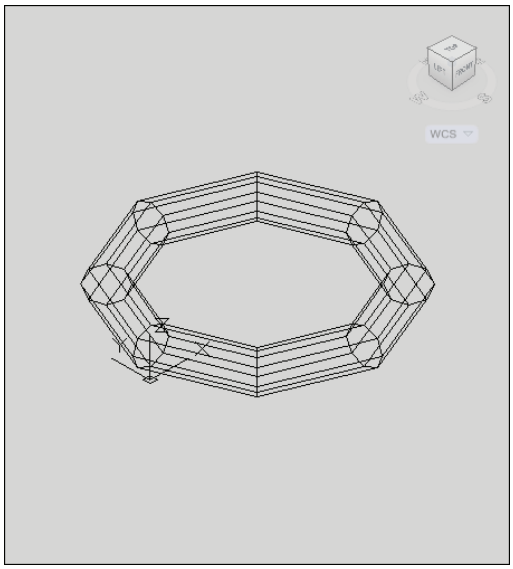
Command: **MESH**

Current smoothness level is set to : 0 Enter an option

[Box/Cone/CYlinder/Pyramid/Sphere/Wedge/Torus/S Ettings]

<Wedge>: **TORUS**

Specify center point or [3P/2P/Ttr]: Specify radius or [Diameter] <2.0000>: **6** Specify tube radius or [2Point/Diameter]: **1**



1.3.15.8. Mesh Tesselations

By default, new mesh primitives are created with no smoothness. To change the default smoothness, enter mesh at the Command prompt. Specify the Settings option before you specify the type of mesh primitive you want to create.

Type MESH at the command prompt.

Command: **MESH**

Enter an option [Box/Cone/CYlinder/Pyramid/Sphere/Wedge

/Torus/SEttings]

<Box>: **SE**

Specify level of smoothness or [Tessellation] <0>: **3**

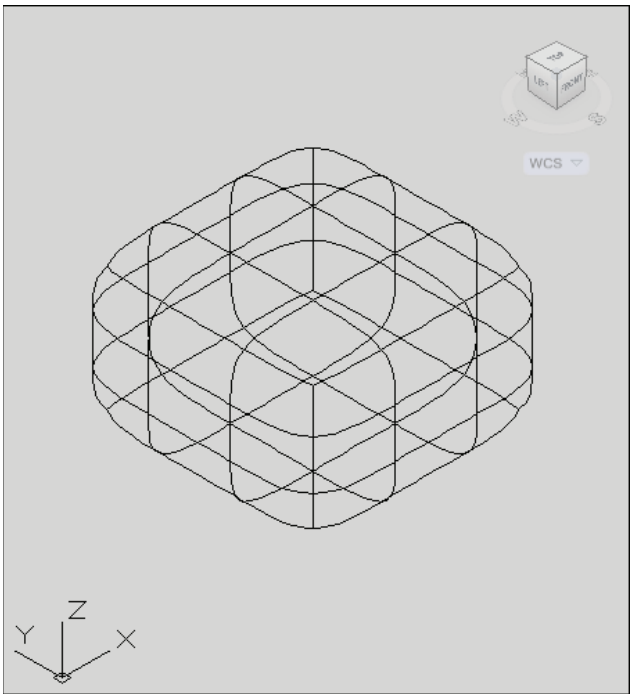
Enter an option [Box/Cone/CYlinder/Pyramid/Sphere/Wedge/ Torus/SEttings]

<Box>: **BOX**

Specify first corner or [Center]: **pick point**

Specify other corner or [Cube/Length]: **@5,5**

Specify height or [2Point] <**3.0000**>:



1.3.15.9. Mesh Smooth

Converts 3D faces (3DFACE) and legacy polygonal and polyface meshes (from AutoCAD 2009 and earlier). You can also convert 2D objects such as regions and closed polylines. The default mesh settings are defined in the Mesh Tessellation Options dialog box. The level of smoothness upon conversion depends on the mesh type setting in this dialog box. If the mesh type is not set to be optimized, the converted object is not smoothed

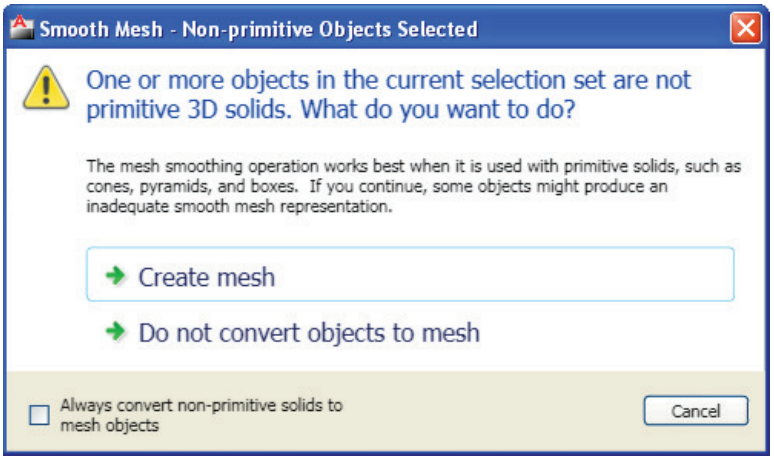
Type MESHSMOOTH at the command prompt.

Command: **MESHSMOOTH**

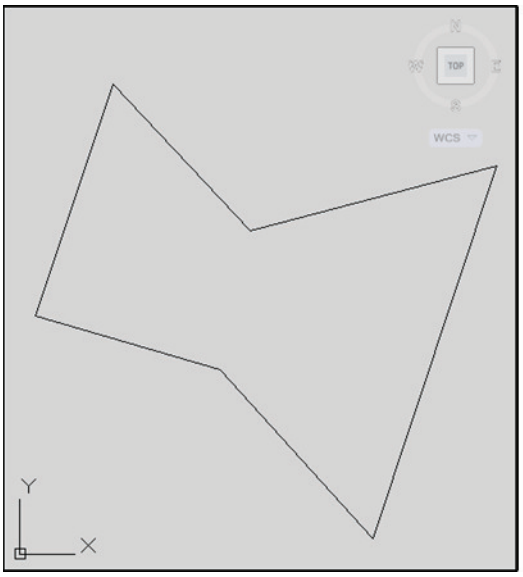
Select objects to convert: **pick object**

Select objects to convert: **press enter**

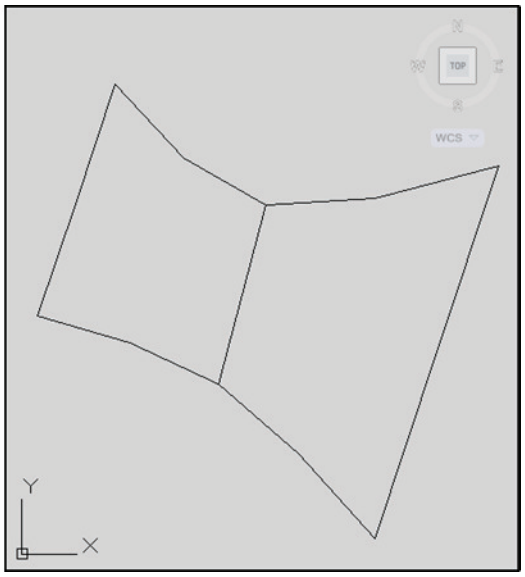
Click Create mesh.



Polyline before MESHSMOOTH

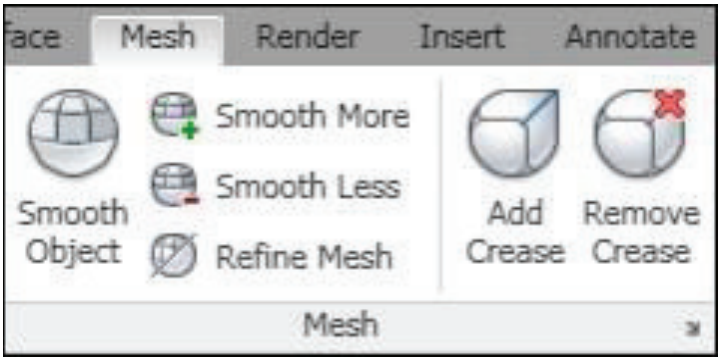


2D Polyline after MESHSMOOTH



1.3.15.10. Smooth and Refine Meshes

The following commands control the smoothness of mesh objects.



Meshsmoothmore

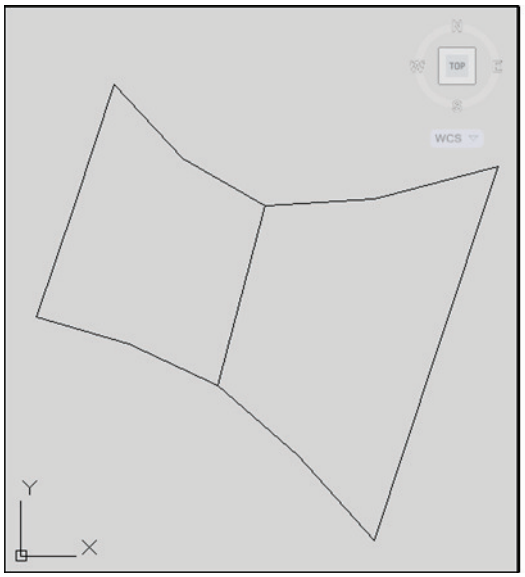
Increases the level of smoothness for mesh objects by one level.

Type MESHSMOOTHMORE at the command prompt.

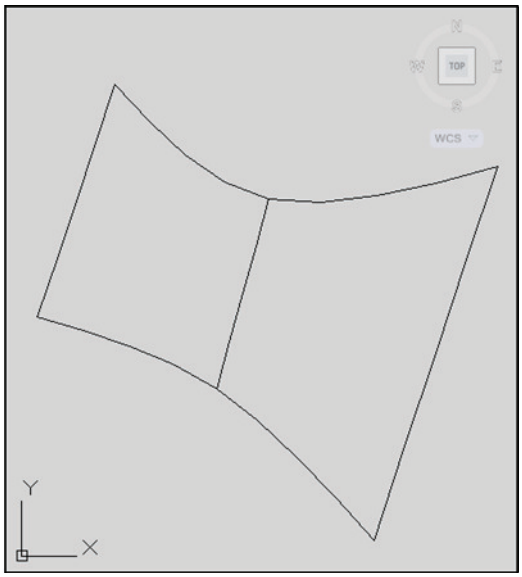
Command: **MESHSMOOTHMORE**

Select mesh objects to increase the smoothness level: **pick object**.

Mesh before smooth increase



Mesh after smooth increase



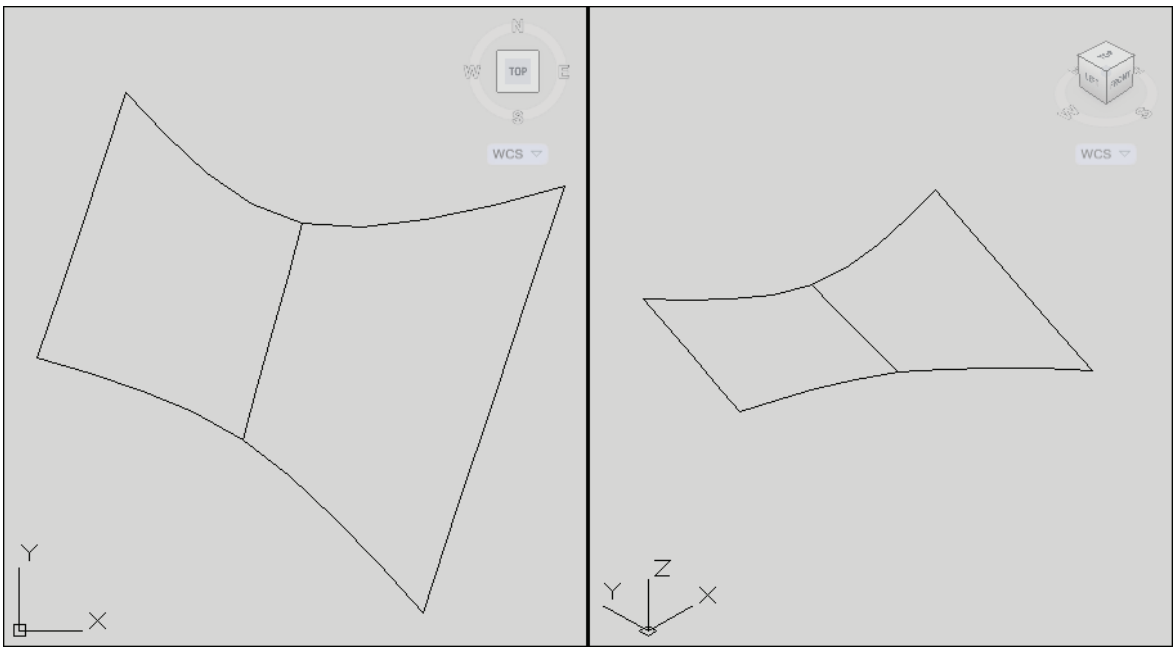
1.3.15.11. Meshsmoothless

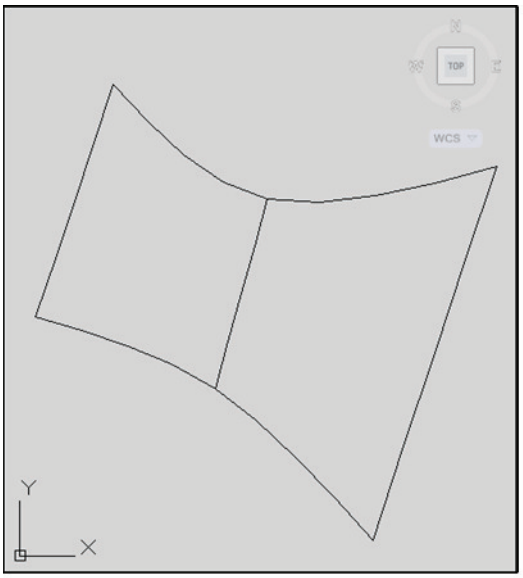
Decreases the level of smoothness for mesh objects by one level.

Type MESHSMOOTHLESS at the command prompt.

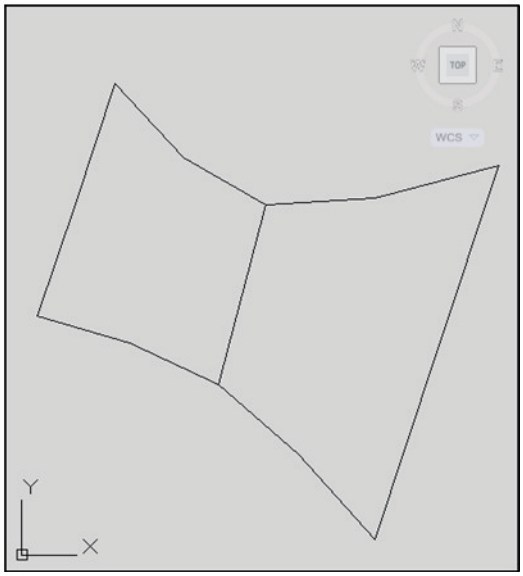
Command: **MESHSMOOTHLESS**

Select mesh objects to increase the smoothness level: **pick object**.





Mesh before smooth decrease



Mesh after smooth decrease

1.3.15.12. Meshsmoothrefine

Multiplies the number of faces in selected mesh objects or faces.

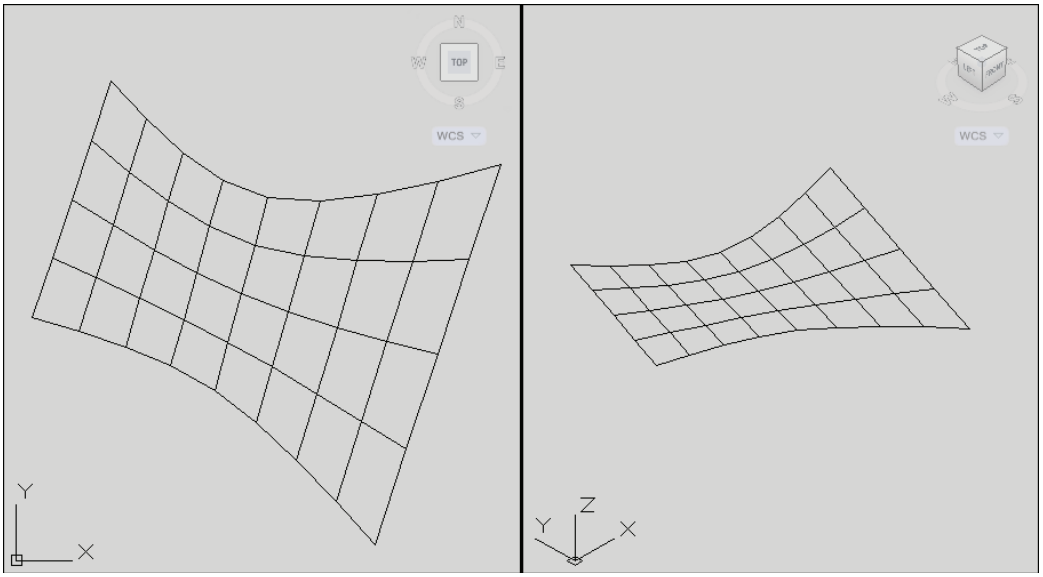
.Type MESHREFINE at the command prompt.

Command: '_**MESHREFINE**

Select mesh object or face subobjects to refine:

Pick object

Select mesh object or face subobjects to refine: 1 object(s) found.



Mesh refine before *Mesh refine after*

1.3.15.13. Add and Remove Mesh Creases

Meshcrease

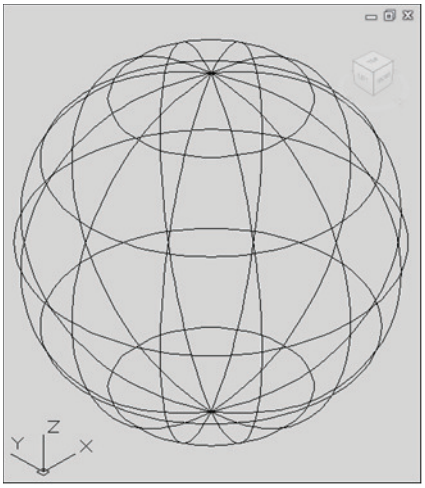
Sharpens the edges of selected mesh subobjects.

Type MESHCREASE at the command prompt.

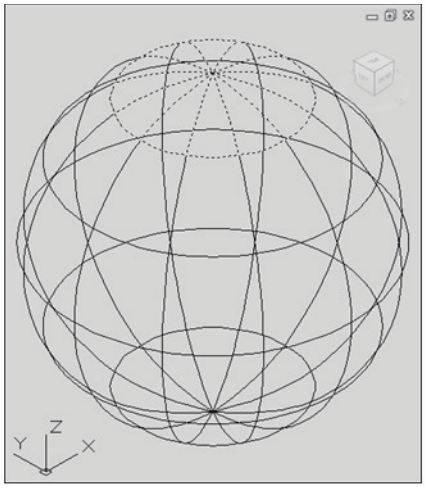
Command: **MESHCREASE**

Select mesh subobjects to crease: **select objects**

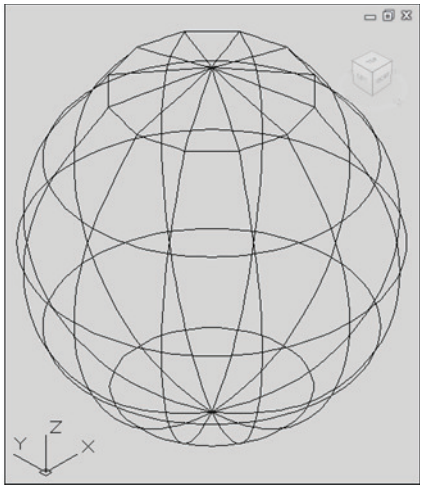
Specify crease value [Always] <Always>: enter



Before crease



Selected objects



After crease

TIPS:

Crease value

Sets highest smoothing level at which the crease is retained. If the smoothing level exceeds this value, the crease is also smoothed. Enter a value of 0 to remove an existing crease.

Always

Specifies that the crease is always retained, even if the object or subobject is smoothed or refined. A crease value of -1 is the same as Always

- **Editing Meshes**

i. Meshextrude

Extends a mesh face into 3D space.

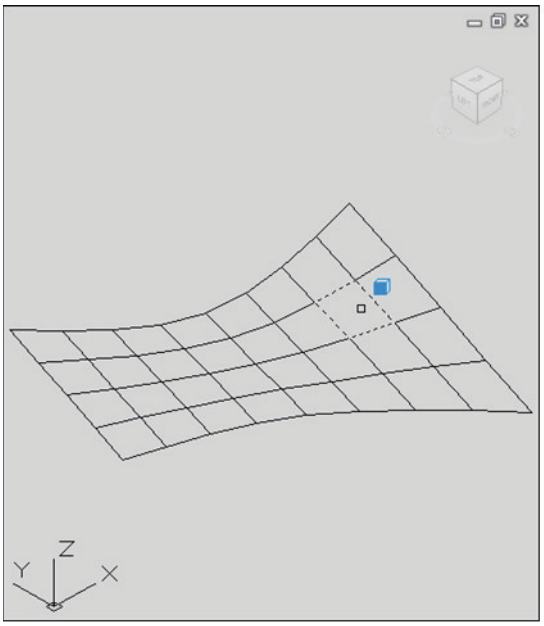
Type MESHEXTRUDE at the command prompt.

Command: **_MESHEXTRUDE** Adjacent extruded faces set to: Join

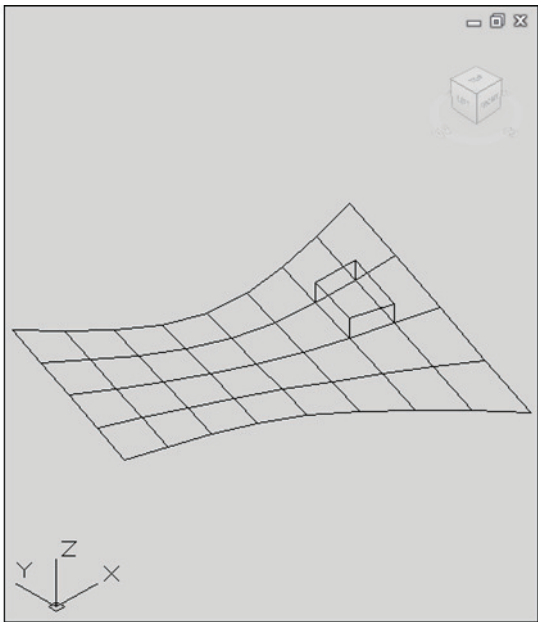
Select mesh face(s) to extrude or [Setting]:

pick object(s)

Select mesh face(s) to extrude or [Setting]: Specify height of extrusion or [Direction/Path/Taper angle] <0.5000>: **1**



Selected mesh face



Extruded mesh faces

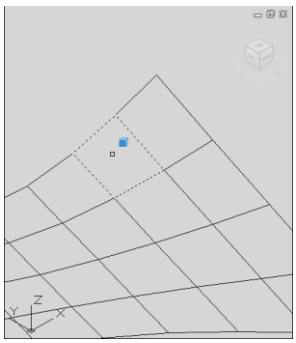
ii. Meshsplit

Splits a mesh face into 2 faces.

1Type MESHSPLIT at the command prompt.

Command: **_MESHSPLIT**

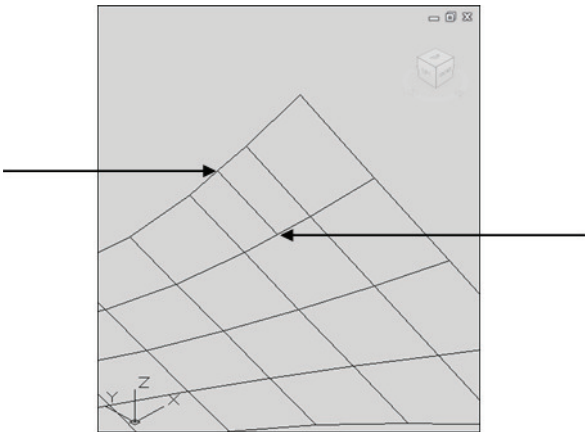
Select a mesh face to split: **(pick object)**



Specify first split point on face edge or [Vertex]:**MID** of

Specify second split point on face edge or [Vertex]:

MID of

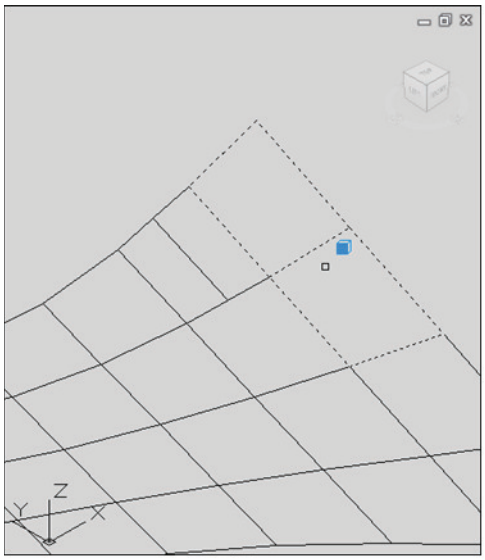


MIDpoint

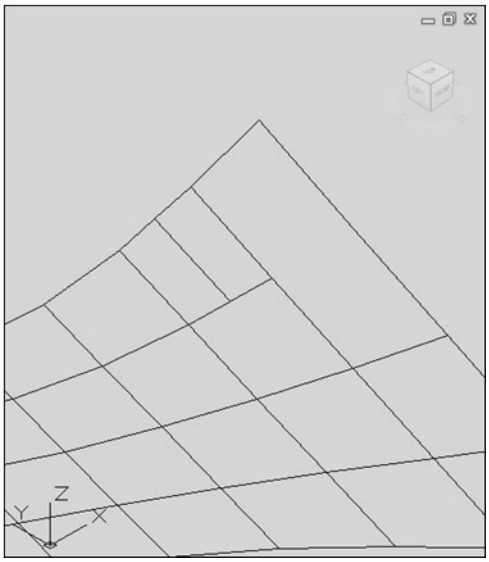
iii. Mergeface

Merges adjacent faces into a single face.

Type MESHMERGE at the command prompt.



Selected mesh faces



Resultant merge

Command: **_MESHMERGE**

Select adjacent mesh faces to merge: (pick object) Select adjacent mesh faces to merge: (pick object) Select adjacent mesh faces to merge: press enter

iv. Meshcap (Close Hole)

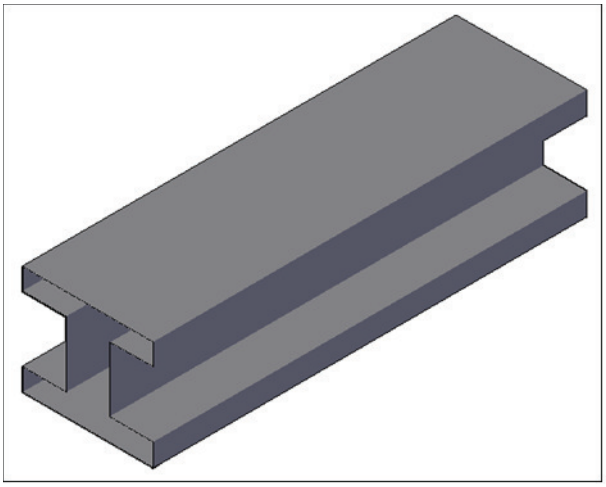
Creates a mesh face that connects open edges.

Type MESHCAP at the command prompt.

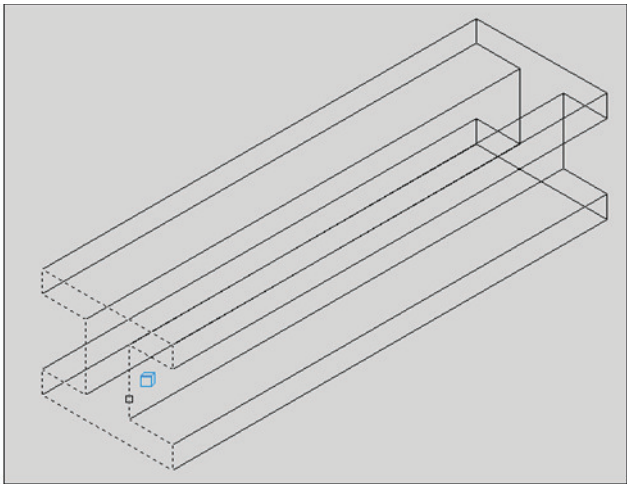
Command: _MESHCAP

Select connecting mesh edges to create a new mesh face: (pick objects)

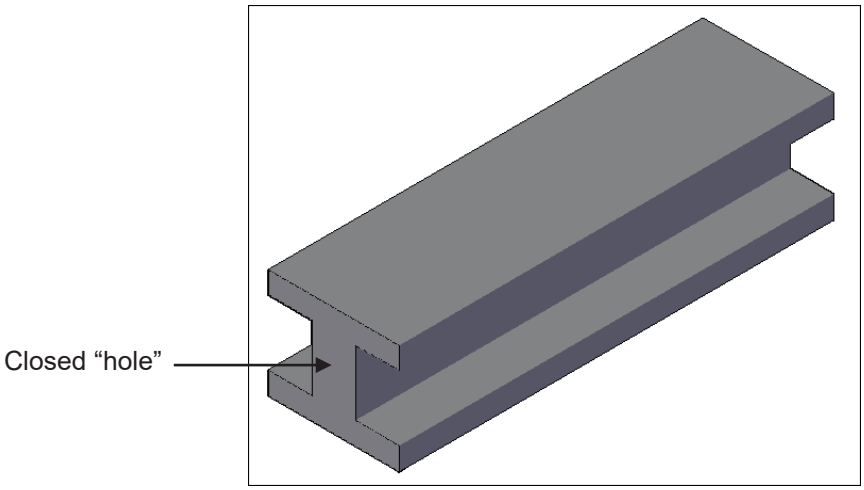
Select connecting mesh edges to create a new mesh face: press enter



Mesh object before



Selected mesh edges



v. Converting Meshes

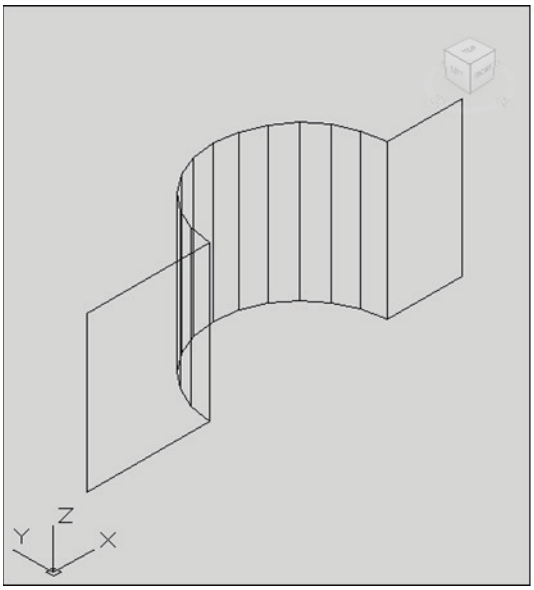
Converts objects to surfaces. Objects that can be converted to surfaces include the following: 2D solids, 3D solids, Regions, open, zero-width polylines with thickness, lines with thickness, arcs with thickness, mesh objects, planar 3D faces

Type CONVTOSURFACE at the command prompt.

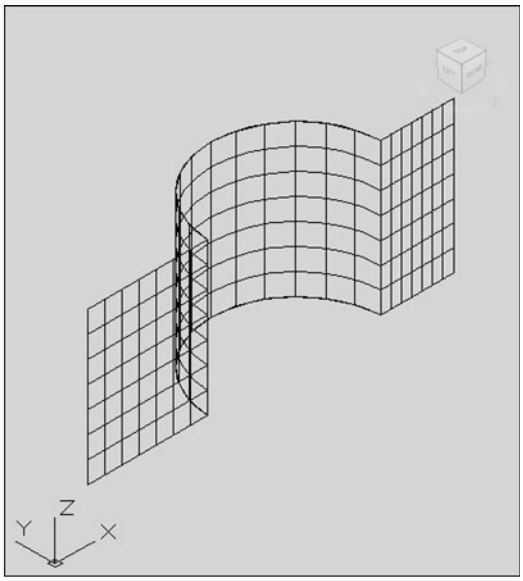
Command: **CONVTOSURFACE**

Mesh conversion set to: Smooth and optimized. Select objects: **pick object**

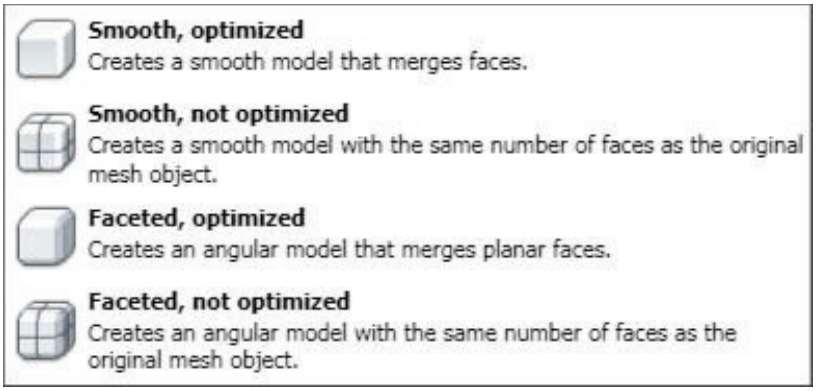
Select objects: **press enter**



PLine with thickness



New converted mesh



Smooth options

vi. Revolved Surfaces

Regenerates a three-dimensional model with hidden lines

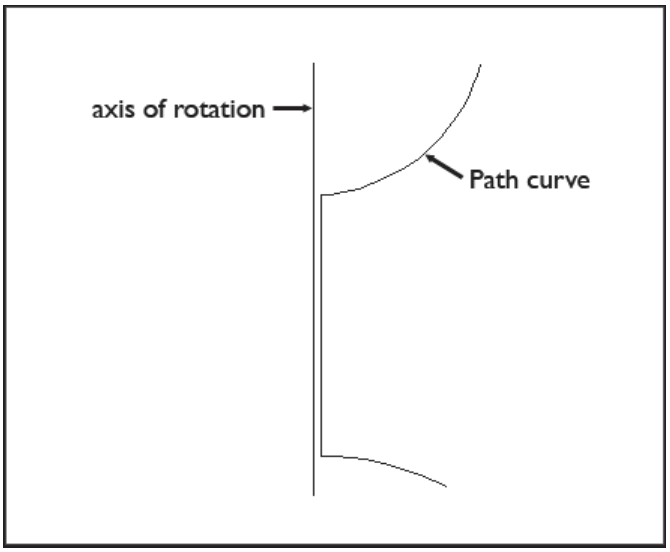
Type REVSURF at the command prompt.

Command: **REVSURF** Current wire frame density: SURFTAB1=6 SURFTAB2=6

Select object to revolve: **pick path curve** Select object that defines the axis of revolution: pick line

Specify start angle <0>: **enter**

Specify included angle (+=ccw, -=cw) <360>: **enter**



vii. Surftab Variables

Sets the number of tabulations for both directions to be generated for RULESURF and TABSURF. Also sets the mesh density in ROTATE3D the M direction for REVSURF and EDGESURF commands.

Type Surftab1 at the command prompt.

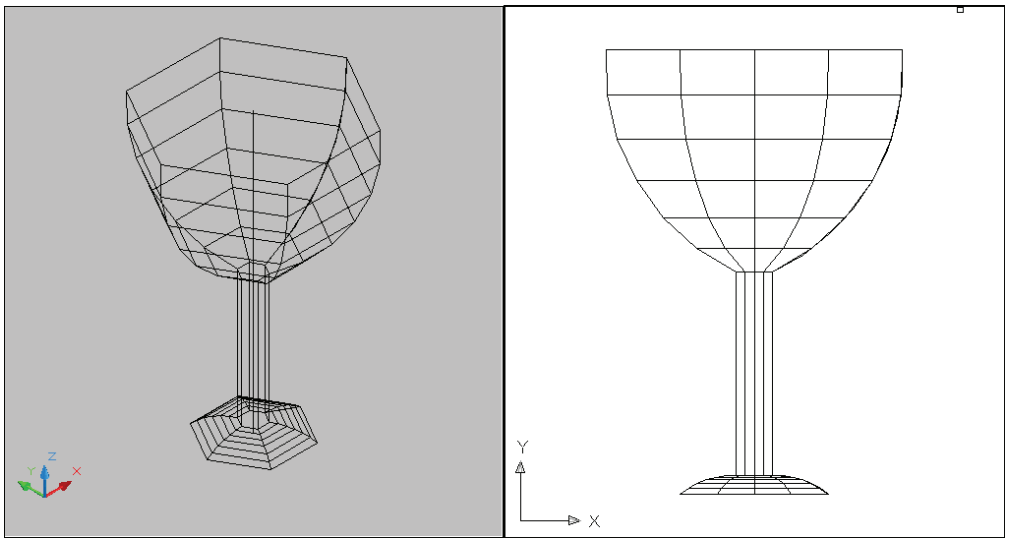
Command: **SURFTAB1**

Enter new value for SURFTAB1 <6>: **30**

Type Surftab2 at the command prompt.

Command: **SURFTAB2**

Enter new value for SURFTAB2 <6>: **30**



Type Revsurf at the command prompt.

Command: **REVSURF**

Current wire frame density: SURFTAB1=30 SURFTAB2=30

Select object to revolve: **pick path curve**

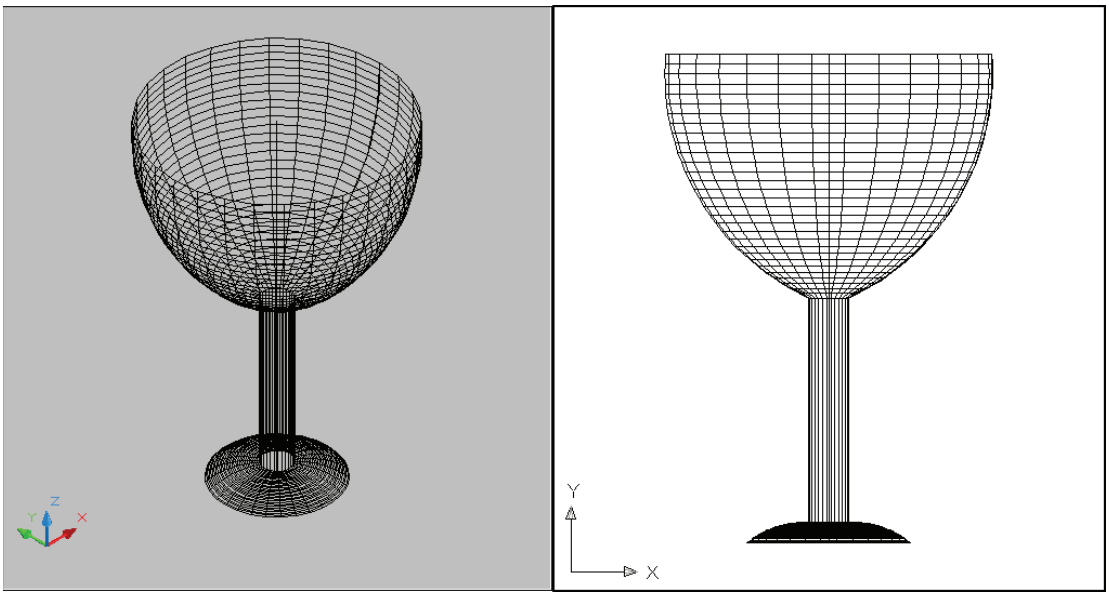
Select object that defines the axis of revolution:

pick line

Specify start angle <0>: **enter**

Specify included angle (+=ccw, -=cw) <360>:

press enter

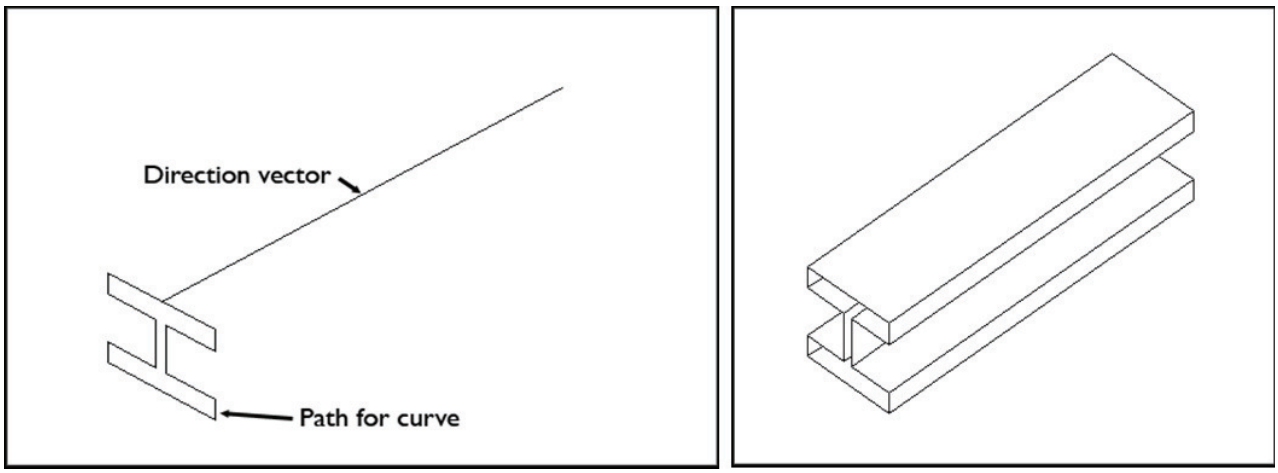


viii. Tabulated Surfaces

Type TABSURF at the command prompt.

Command: **TABSURF**

Select object for path curve: Select object for direction vector:

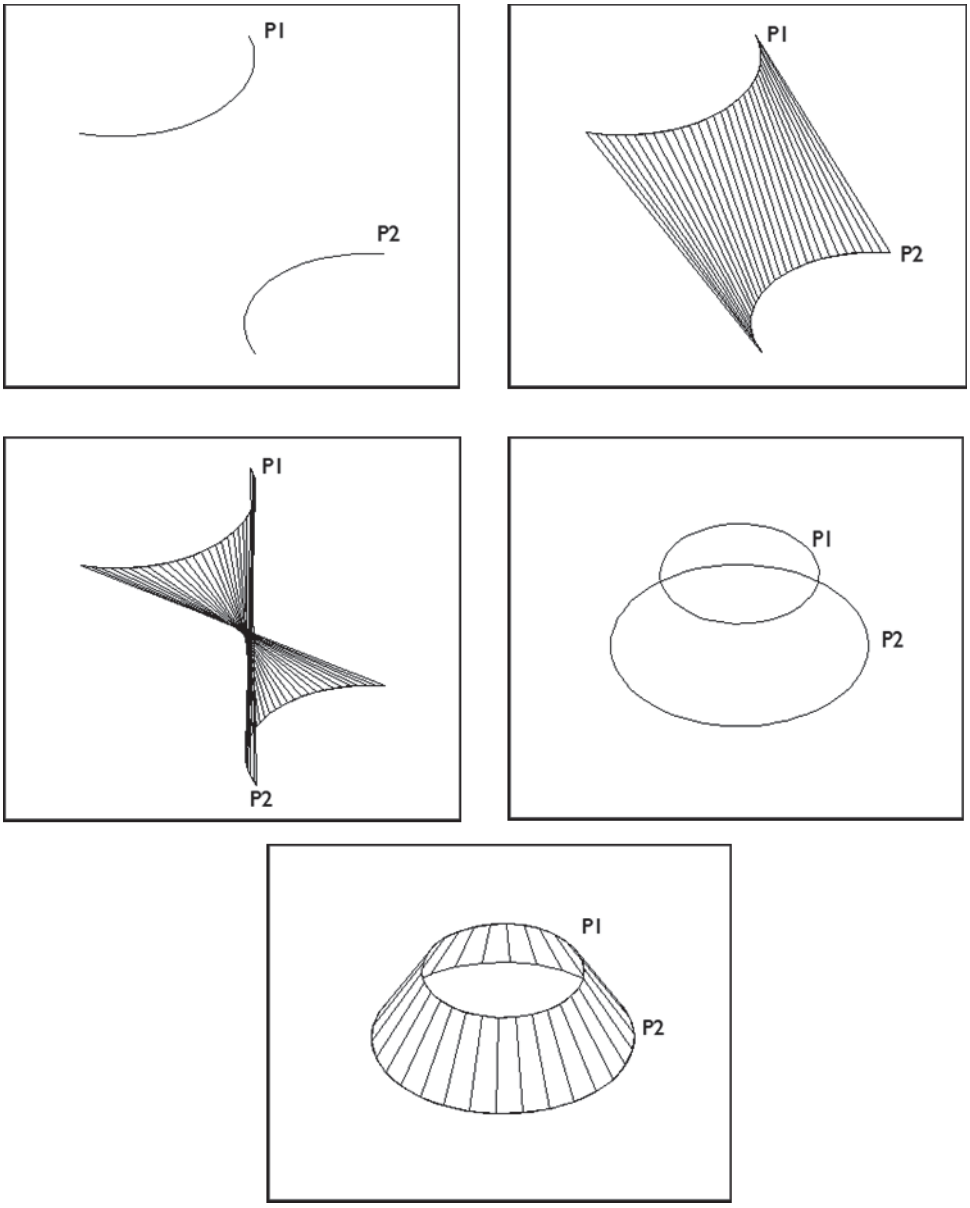


1.3.15.14. Ruled Surfaces

Type RULESURF at the command prompt. Command: **rulesurf**

Current wire frame density: SURFTAB1=6 Select first defining curve: **P1**

Select second defining curve: **P2**



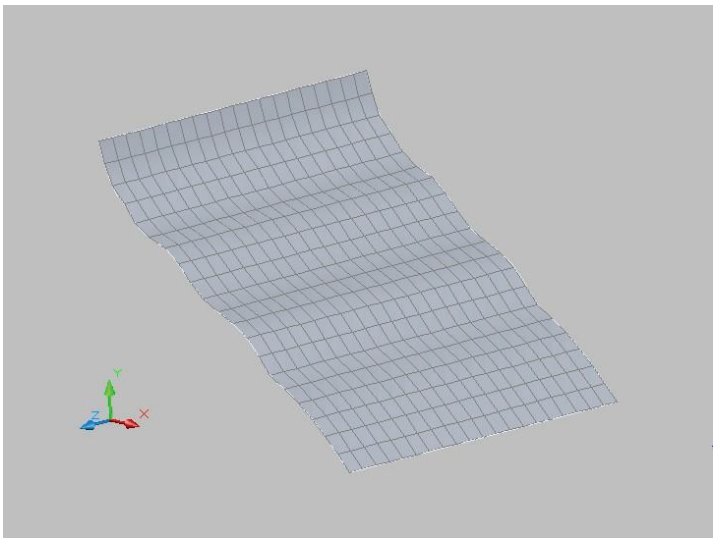
1.3.15.15. Edge Surfaces

Regenerates a three-dimensional model with hidden lines

Type EDGESURF at the command prompt.

Command: **EDGESURF** Current wire frame density: SURFTAB1=20 SURFTAB2=10

Select object 1 for surface edge: **P1** Select object 2 for surface edge: **P2** Select object 3 for surface edge: **P3** Select object 4 for surface edge: **P4**



1.3.15.16. Planesurf

Creates a planar surface by selecting a closed object or by creating a rectangular plane.

Type PLANESURF at the command prompt.

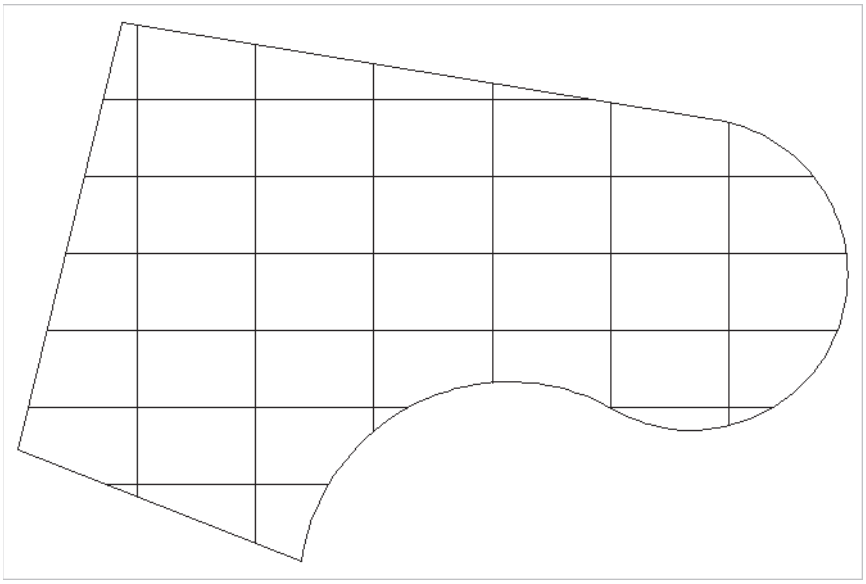
Command: **PLANESURF**

Specify first corner or [Object] <Object>: **press enter**

Select objects: **pick object**

Select objects: **press enter**

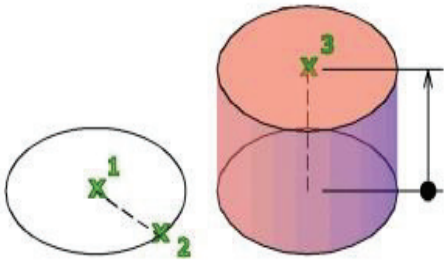
Planar surface



Project for Students:

Practice # 1

Create a cylindrical shape object with Radius of 6” and Height 12” by using cylinder command.
Through Short Cut Key → Cylinder enter
Application
Type **Cyl** at the Command Prompt
→ Specify center point of base
→ type the base radius value 6”
→Type the Value of Height 12”
→press enter key



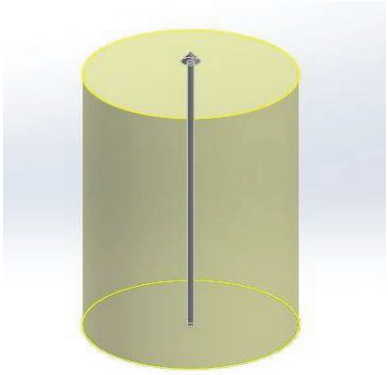
Practice # 2

Create a cylindrical shape object with radius of 6” and height 12” by using extrudes command.

Through Short Cut Key → Ext enter

Application

Step 1
Type “C” and press enter key.
→ Specify base point of circle: click on screen for center point.
→**Type the Radius of circle 6” and press enter key.**
Now the circle of radius 6” has been created.
Step 2
Type “EXT” and press enter key.
→ Select Object: select the circle drawn on the screen. And press enter key.
→ Specify height of extrusion of the circle 12” and press enter key



Practice-3

Develop a BOX with Dimensions of
3’-0 x 4’-0 x 8’-0.

Type “BOX” in the command line and press enter key.

Or

Select Box option from modeling category of Home Tab.

→Specify first corner (Center): click on the screen the first corner.
Specify other corner or (Cube/ Length): Type: L and press enter key.
Specify Length: Type: 3’ and press enter key.
Specify width: Type: 4’ and press enter key.
Specify height or [2Point] <12.0000>: 8’ and press enter key.

Practice-4

Develop a Pyramid with 10” radius with the Height of 12”.

Through Short Cut Key(alias): PYR
Full name of command: PYRAMID

Type “PYR” in the command line and press enter key.

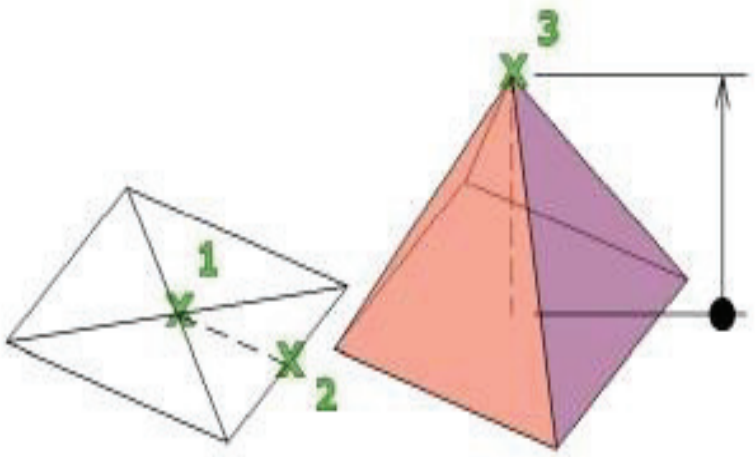
Or

Select Pyramid option from modeling category of Home Tab.

Command: _pyramid

4 sides Circumscribed

1) Specify center point of base or [Edge/Sides]: click on screen
2) Specify base radius or [Inscribed] <6.0000>: Type ”I” and press enter key
3) Specify base radius or [Circumscribed] <6.0000>: Type ”10” and press enter key
4) Specify height or [2Point/Axis endpoint/Top radius] <96.0000>: Type ”10” and press enter key



Learning Unit 2:

Manipulate 3D Objects Using 3d Editing Tools

Objective:

In this learning unit you will learn how to use modifying tools for 3D objects editing, prepare 3D models.

After completion of this learning unit you will be able to understand following.

Learning Outcomes:

- Modify 3D objects in line with the requirements.
- Make customized 3D models according to the requirement of given job.
- Convert 3D Face objects into a single mesh object.

2. Manipulate 3D Objects Using 3D Editing Tools: -

The manipulating 3D objects by modifiing commands is known as editing the 3D modules. For the purpose different 3D commands for modification to be used like as Boolean operations (Subtract and add etc.) other common commands for the purpose are revolve, revovlesurfs, rotate 3D, 3D array etc.

2.1. Modify 3D objects in line with the requirements.

In this unit, you will learn about the development of 3D solid composites. You can combine, subtract or intersect two or more 3D solids by using Boolean operating, able to adjust the thickness of 3D solid, you can draw a temporary 3D solid by interesting two sets of 3D solids.

Execute Boolean operation to modify 3d objects (subtraction, intersection, union, etc.)

2.1.1. Boolean Operations: -

The Boolean commands work only on solids or regions. To create a solid model at initial stage in obtaining one or more primitives. The next stage consists in using Boolean operations of Union, Subtract or Intersect in order to create the solid model

i. Union
ii. Subtract
iii. Intersect
iv. Slice

2.1.1.1. Union:

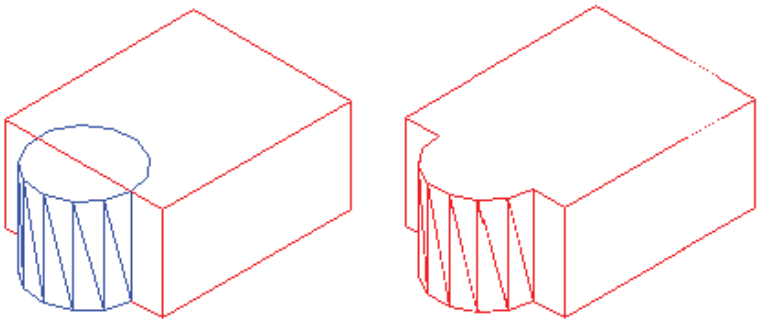
You can combine two or more 3D solids, surfaces, or 2D regions into a single, composite 3D solid, surface, or region. You must select the same type of objects to combine.

Through Short Cut Key → UNI enter

Application

Type **UNI** at the Command Prompt →Select objects→ enter

.



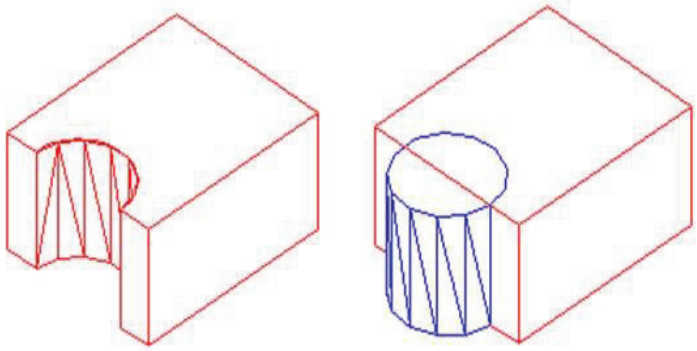
2.1.1.2. Subtract

With SUBTRACT, you can create a 3D solid by subtracting one set of existing 3D solids from another, overlapping set. You can create a 2D region object by subtracting one set of existing region objects from another, overlapping set. You can select only regions for use with this command.

Through Short Cut Key → su enter

Application

Type **SU** at the Command Prompt → SUBTRACT Select solids and regions to subtract from →enter → Select solids and regions to subtract → enter



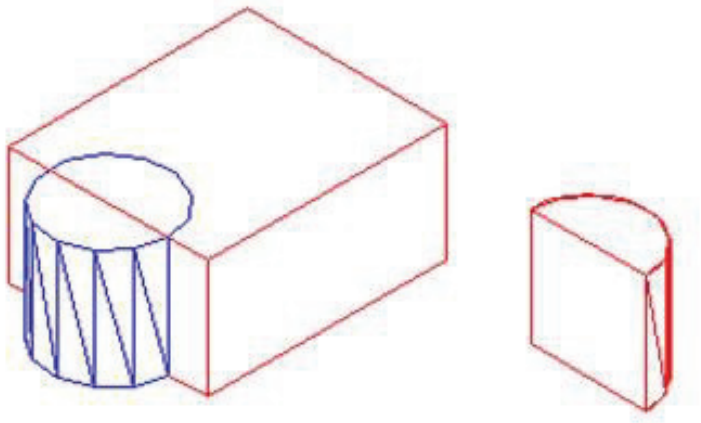
2.1.1.3. Intersect

Create a 3D solid, surface, or 2D region from overlapping solids, surfaces, or regions. With INTERSECT, you can create a 3D solid from the common volume of two or more existing 3D solids, surfaces, or regions. If you select a mesh, you can convert it to a solid or surface before completing the operation.

Through Short Cut Key → in enter

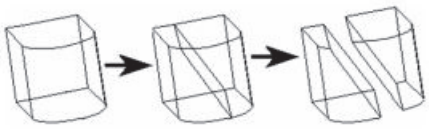
Application

Type **IN** at the Command Prompt → Select objects→ **enter**



2.1.1.4. Slice

Creates new 3D solids and surfaces by slicing, or dividing, existing objects.



The cutting plane is defined with 2 or 3 points, by specifying a major plane of the UCS, or by selecting a surface object (but not a mesh). Either one or both sides of the sliced 3D solids can be retained.

The sliced objects retain the layer and color properties of the original solids. However, the resulting solid or surface objects do not retain a history of the original objects.

- **Objects that Can Be Used in a Slice Operation**

Objects that can be sliced	Objects that can be used as cutting planes
3D solids	Surfaces
Surfaces	Circles
	Ellipses
	Circular or elliptical arcs
	2D splines
	3D polyline segments

- **List of Prompts**

  The following prompts are displayed.

- **Objects to slice**

  Specifies the 3D solid or surface object that you want to slice. If you select a mesh object, you can choose to convert it to a 3D solid or surface before completing the slice operation.

  i. Start point of slicing plane
  ii. Planar object
  iii. Surface
  iv. Z axis
  v. View
  vi. XY
  vii. YZ
  viii. ZX

i. Start point of slicing plane

Sets the first of two points that define the angle of the slicing plane. The slicing plane is perpendicular to the *XY*plane of the current UCS.

- **Second point on plane. Sets the second of two points on the slicing plane.**

➢ Point on desired side
➢ Keep both sides

ii. Planar object

Aligns the cutting plane with a plane that contains a selected circle, ellipse, circular or elliptical arc, 2D spline, or 2D polyline segment.

- **Select a circle, ellipse, arc, 2D-spline, or 2D-polyline.** Specifies the object to use for alignment.

iii. Surface

Aligns the cutting plane with a surface.

- **Select a surface.** Specifies a surface to be used for alignment.

Note You cannot select meshes created with the EDGESURF, REVSURF, RULESURF, and TABSURF commands.

➢ Point on desired side
➢ Keep both sides

iv. Z axis

Defines the cutting plane by specifying a point on the plane and another point on the *Z* axis (normal) of the plane.

- **Specify a point on the section plane.** Sets a point on the slicing plane.
- **Specify a point on the Z-axis (normal) of the plane.** Specifies a point that defines the axis that is perpendicular to the slicing plane.

➢ Point on desired side
➢ Keep both sides

v. View

Aligns the cutting plane with the current viewport's viewing plane. Specifying a point defines the location of the cutting plane.

- **Specify a point on the current view plane.** Sets a point on the object to start the slice.

➢ Point on desired side
➢ Keep both sides

vi. XY

Aligns the cutting plane with the *XY* plane of the current user coordinate system (UCS). Specifying a point defines the location of the cutting plane.

- **Point on the XY-plane.** Sets the location of the slice.

➢ Point on desired side
➢ Keep both sides

vii. YZ

Aligns the cutting plane with the *YZ* plane of the current UCS. Specifying a point defines the location of the cutting plane.

- **Point on the YZ-plane.** Sets the location of the slice.

viii. ZX

Aligns the cutting plane with the *ZX* plane of the current UCS. Specifying a point defines the location of the cutting plane.

- **Point on the ZX-plane.** Sets the location of the slice.

If a single object is sliced into more than two objects, one solid or surface is created from the objects on one side of the plane and another solid or surface is created from the objects on the other side.

ix. 3points

Defines the cutting plane using three points.

- **Point on desired side**

Uses a point to determine which side of the sliced solids your drawing retains. The point cannot lie on the cutting plane.

- **Keep both sides**

Retains both sides of the sliced solids. Slicing a single solid into two pieces creates two solids from the pieces on either side of the plane. SLICE never creates more than two new composite solids for each selected solid.

x. How to execute the command

- **By use of Buttons**

Ribbon: → Home tab → Solid Editing panel → Slice

Menu: Modify → 3D Operations → Slice

i. Open a drawing with 3D objects and display in a 3D view.
ii. Choose Modify, 3D Operation, Slice.

Or

iii. Type SLICE at the command prompt.
Command: **slice**

Select objects to slice: By selecting the object the message will be “1 found”

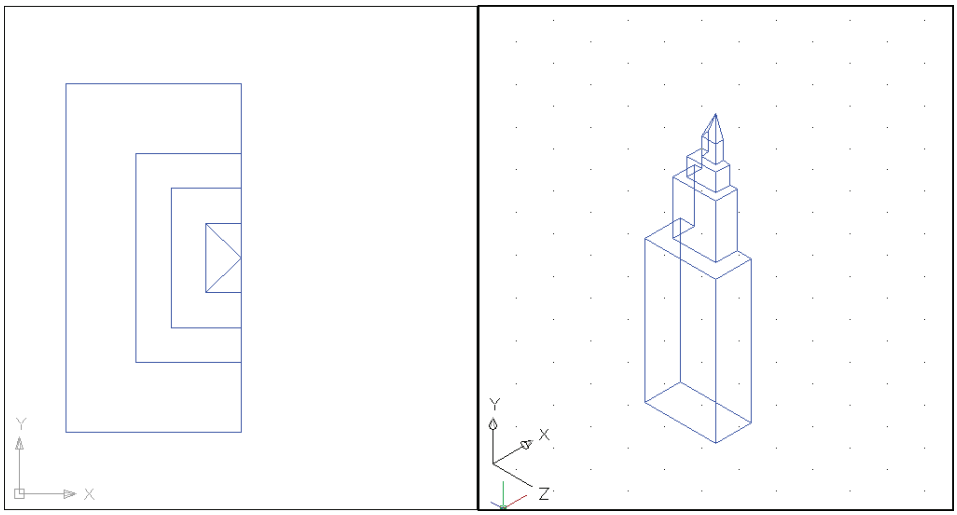
Specify start point of slicing plane or [planar Object/Surface/Zaxis/View/XY/YZ/ZX/3points] <3points>: **Press enter**

Specify first point on plane: >> click at mid on one side at bottom of object

Specify second point on plane: >> click at mid on one side at top of object

Specify third point on plane: >> click at mid on opposite side at top of object

Specify a point on desired side or [keep Both sides] <Both>: Type **B** and press enter



Other options are:

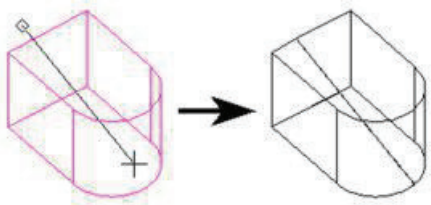
Slice by Line

Slices objects by a plane perpendicular to the current view, defined by two points. This is the default option.

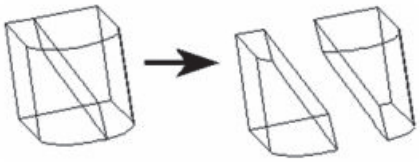
i. Select Slice by Line (2 Points) from the local menu or Inspector Bar.

ii. Select the objects to slice. You can use Shift to select more than one object.

iii. Select two points the slicing plane will pass through the line defined by these points, in the direction normal to the current view (into the screen).
The slice is created, though in the current view the dividing plane appears as a line.



You can rotate the view and move one of the new objects to see how the original object was sliced.



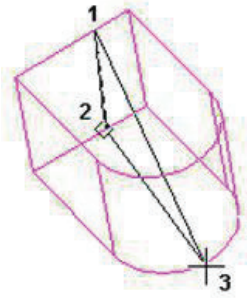
Slice by Plane

Slices objects by defining the slicing plane. The plane is defined by three points.

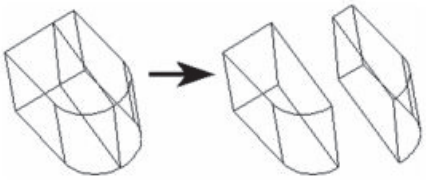
i. Select Slice by Plane (3 Points) from the local menu or Inspector Bar.

ii. Select the object to section. You can use Shift to select more than one object.

iii. Select three points to define the slicing plane.



The slice is created. You can move one of the new objects to see how the original object was sliced.

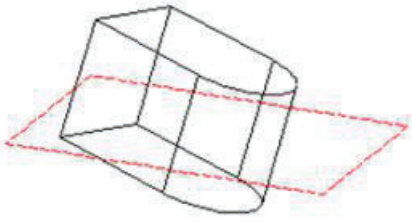


Slice by Workplane

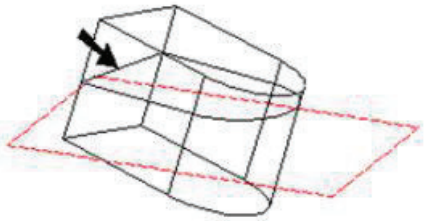
Slices objects by using the current workplane as the slicing plane.

i. Select Slice by Workplane from the local menu or Inspector Bar.

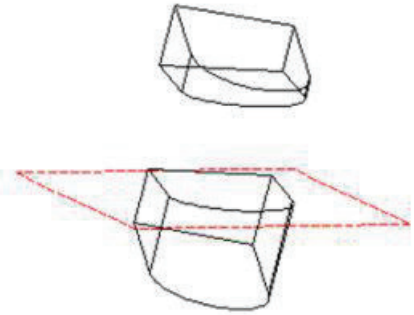
ii. Select the object to slice.



Note: To slice multiple objects, start out using a different option - Slice by Line or Slice by Plane. Use Shift to select the objects to slice, then click the Slice by Workplane icon. The object is sliced.



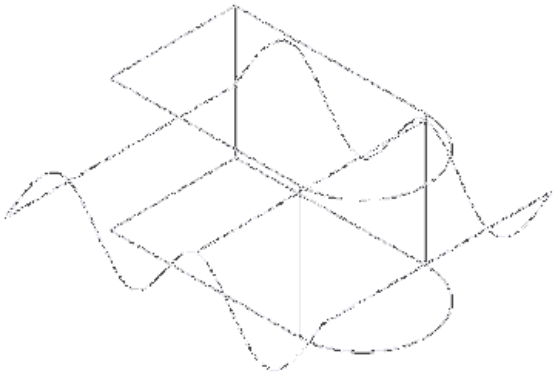
You can move one of the new objects to see how the original object was sliced.



Slice by Surface

Slices the object by using a surface. The surface must be a ACIS solid surface.

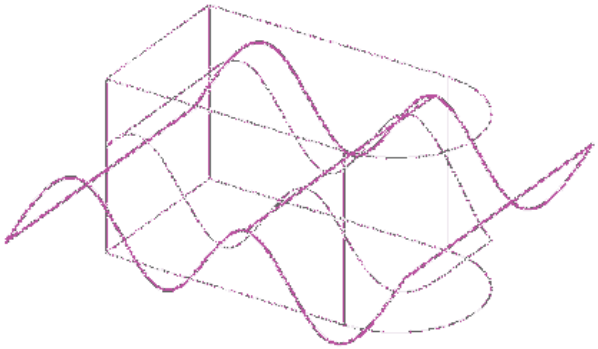
i. Select Slice by Surface from the local menu or Inspector Bar.



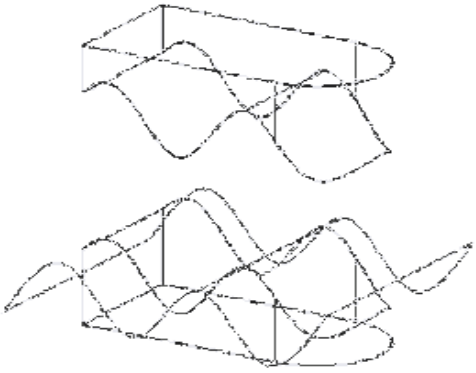
ii. Select the object to be sliced.

Note: To slice multiple objects, start out using a different option - Slice by Line or Slice by Plane. Use Shift to select the objects to slice, then click the Slice by Workplane icon. The object is sliced.

iii. Select the object to do the slicing.



You can move one of the new objects to see how the original object was sliced.

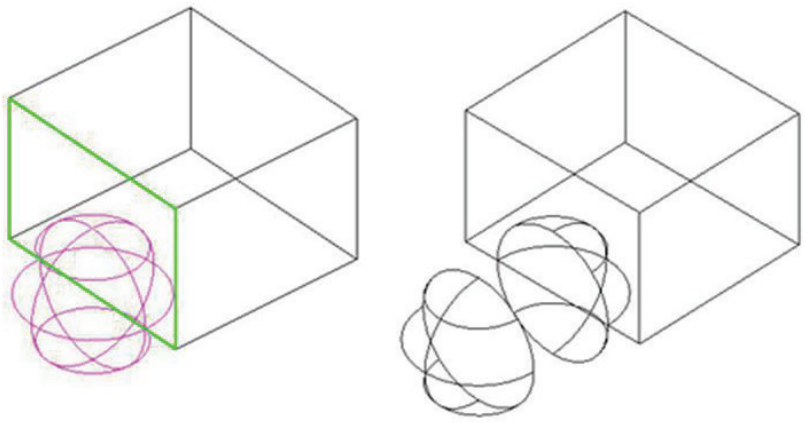


Slice by Facet

Slices objects by a plane perpendicular to the current view, defined by two points. This is the default option.

i. Select Slice by Facet from the local menu or Inspector Bar.

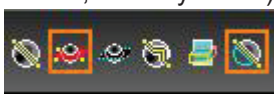
ii. Select the objects to slice. You can use Shift to select more than one object.
iii. Select the facet that will be used to slice the object.



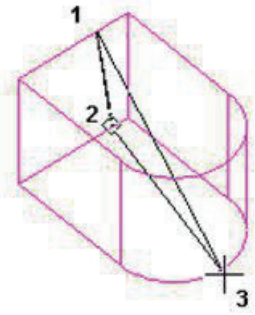
You can rotate the view and move one of the new objects to see how the original object was sliced.

Delete a Sliced Part

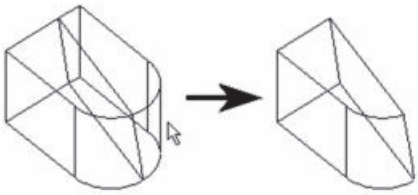
Removes one of the new objects created by slicing objects. This option is used in tandem with one of the other options.

i. Select the desired slicing option (in this case, Slice by Plane) and Delete a Sliced Part from the local menu or Inspector Bar. 

ii. Select the object to section. You can use Shift to select more than one object. Slice the object by the selected method, in this case, defining a plane by three points.

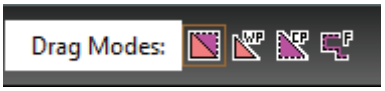


iii. The slice is created. Select the object you want to delete.



Tip: Objects created as a result of slicing can also be deleted by selecting them and pressing the Delete key.

Note: Boolean operations can use multi-select modes to select objects as components for operations.



2.2. Make Customized 3D Models according to the requirement of Given Job.

3D Models as per requirements can be created by use of basic 3d objects and then transforming the same to the job requirements by use of Modifying commands. Those may be above mentioned Boolean operations command or below mentioned modifying commands for 3D models/ objects/ surfaces.

At the initial stage we usually create 2D objects from 2D commands. Then we modify these to be converted into 3D objects.

There are two methods to convert a line into a poly line.

- **Boundary Command**

  This command use for 2D close object converts in to poly line

- **Polyline Edit Command**

  This command for 2D open object converts in to poly line

- **Boundary Command**

  Create a region or a polyline from an enclosed area.

  Boundary command can be found out through following methods:

  Through Short Cut Key → Bo enter

  Application

  Type Bo at the Command Prompt → enter→ Open Boundary Window →pick point →enter

- **Polyline Edit Command**

  Common uses for PEDIT include joining 2D polylines, converting lines and arcs into 2D polylines, and converting polylines into curves that approximate B-splines (spline-fit polylines).

  Short Cut Key → PE enter

  Application

  Type **PE** at the Command Prompt → enter→ Select polyline → enter→ J enter (For Join the line) → Select all lines →enter

2.2.1. Manipulate 3D object by using Modify Commands- Extrude, Rotate, Rotate3D, Revolve, Revolve Surface, Shell, Sweep, Loft, etc.

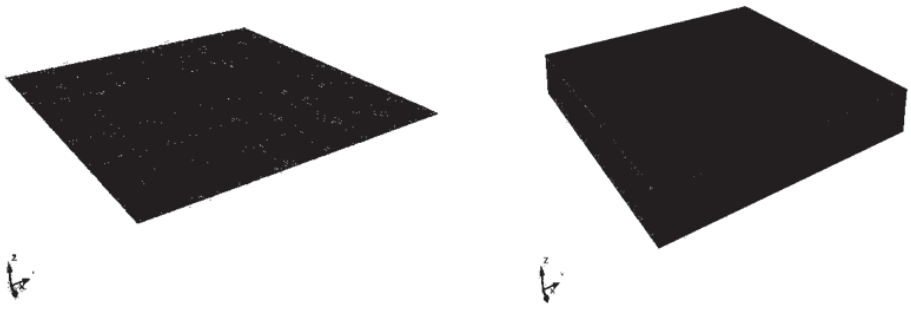
2.2.1.1. Thicken Command: -

Convert a surface into a 3D solid with a specified thickness. A useful technique for modeling a complex 3D curved solid is to first create a surface and then convert it to 3D solid by thickening it. Initially, the default thickness value is zero. During a drawing session, the default value for the thickness is the previously entered thickness value.

Through Short Cut Key → thicken enter

Application

Type **THICKEN** at the Command Prompt → Select surfaces to thicken →Specify thickness <0.0000> →put the thicken value →enter



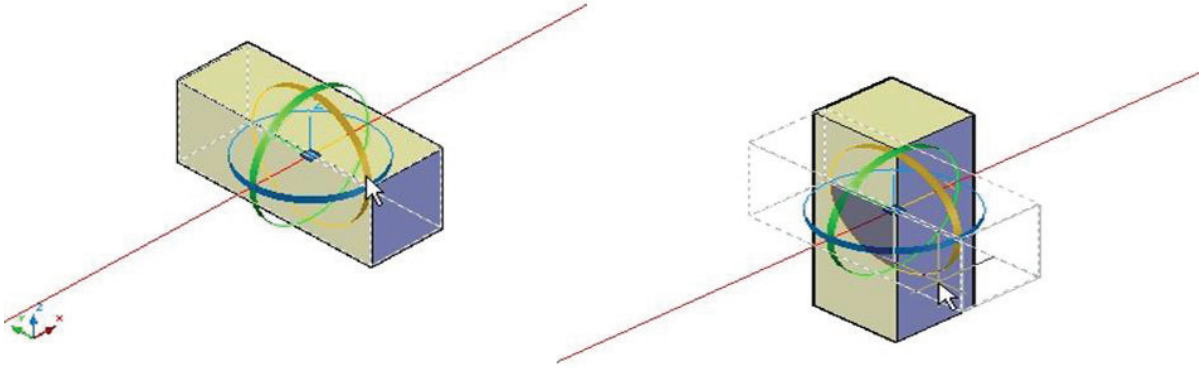
2.2.2. 3D Rotate

3D Rotate command helps to constrain or in rotation of 3D objects and sub-objects along any axis up to a specified angle

APPLICATION

Pick Tool →Select the objects OR hold Ctrl key to select sub-objects (faces, edges, and vertices) →Release Ctrl key and press Enter →The rotate gizmo is displayed attached to the cursor → Click to place the rotating gizmo, specifying the base point for the move → However the cursor over an axis path on the gizmo until it turns yellow and the vector that represents the axis of rotation is displayed. → Specify angle of the rotation.

When you drag the cursor, the selected objects and sub-objects rotate about the base point along the specified axis. The gizmo displays the degree of rotation from the original position of the object as the object moves. You can click or enter a value to specify the angle of the rotation



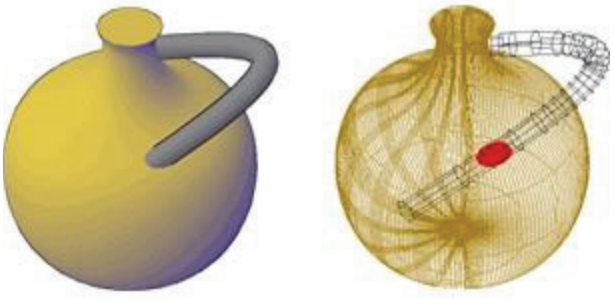
2.2.3. Interfere Command

Create a temporary 3D solid from the interferences between two sets of selected 3D solids. Interferences are highlighted with a temporary 3D solid that represents the intersecting volume. You can also choose to retain the overlapping volumes

Through Short Cut Key → inf enter

Application

Type INF at the Command Prompt → Select first set of objects or [Nested selection/Settings] →Select solids →enter.



2.2.4. Extrude Command

Extrusions can extend in the Z direction or be set to taper or follow a path. You can extrude an open or closed object to create 3D surface or solid

Through Short Cut Key → Ext enter

Application

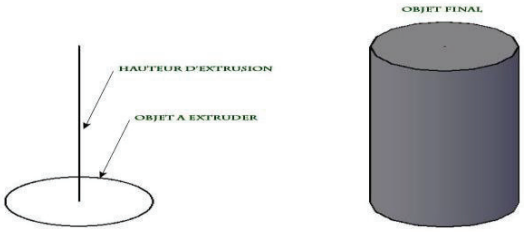
Type Ext at the Command Prompt → Select Object →enter → Specify height of extrusion or [Direction/Path/Taper angle] →enter

- **Extrude Command Options**

i. Height of extrusion
ii. Direction
iii. Path
iv. Taper angle

i. Height of extrusion

Note: Select face and edge sub objects by pressing Ctrl while you select them Extrudes objects along the positive *Z* axis of the object's coordinate system if you enter a positive value. If you enter a negative value, the objects are extruded along the negative *Z* axis. Objects do not have to be parallel to the same plane. If all the objects are on a common plane, the objects are extruded in the direction of the normal of the plane.

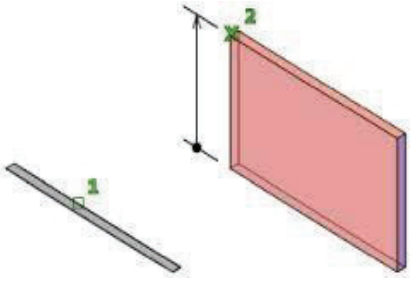


ii. Direction

Specifies the length and direction of the extrusion with two points you specify. (The direction cannot be parallel to the plane of the sweep curve created by the extrusion.

Remember

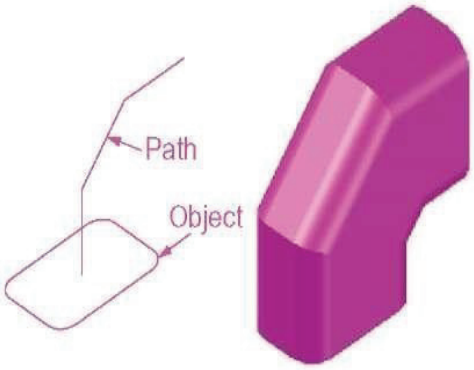
By default, planar objects are extruded in the direction of the object's normal.



- Start point of direction. Specifies the first point in the direction vector.
- End point of direction. Specifies the second point in the direction vector

iii. Path:

Specifies the extrusion path based on an object that you select. The path is moved to the centric of the profile. Then the profile of the selected object is extruded along the chosen path to create solids or surfaces.

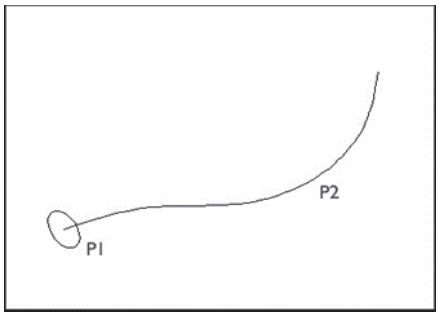


The path should not lie on the same plane as the object, nor should the path have areas of high curvature.

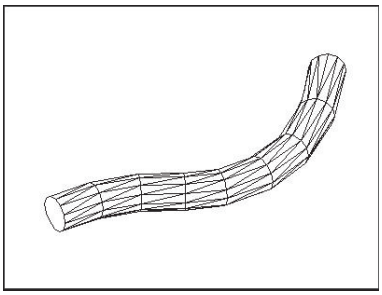
The extrusion starts from the plane of the object and maintains its orientation relative to the path. If the path contains segments that are not tangent, the program extrudes the object along each segment and then miters the joint along the plane bisecting the angle formed by the segments. If the path is closed, the object should lie on the miter plane. This allows the start and end sections of the solid to match up. If the object is not on the miter plane, the object is rotated until it is on the miter plane. Objects with multiple loops are extruded so that all the loops appear on the same plane at the end section of the extruded solid.

Application

Type **Ext** at the Command Prompt → Select Object →enter→ Specify height of extrusion or [Direction/Path/Taper angle] →**P enter (**For Path) →Select Path→ enter



Circle Extruded Along a Path



Hidden Line Removal of Extruded Circle

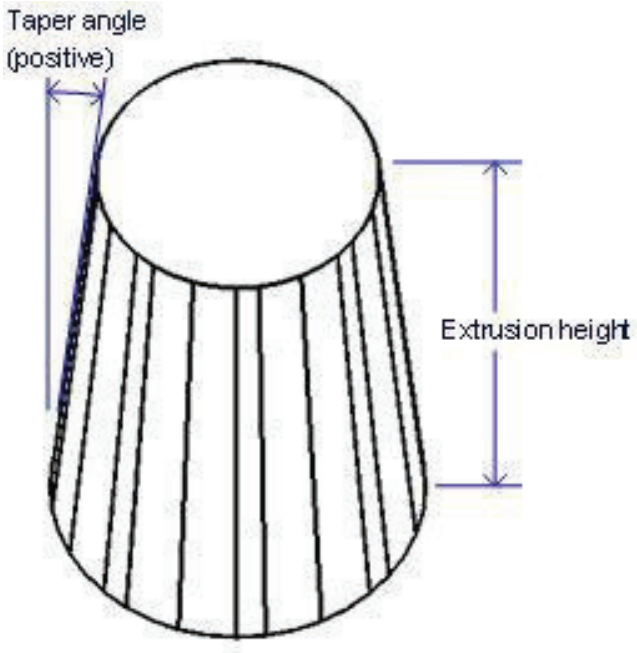
iv. Taper Angle

Positive angles taper in from the base object. Negative angles taper out. The default angle, 0, extrudes a 2D object perpendicular to its 2D plane. All selected objects and loops are tapered to the same value. Specifying a large taper angle or a long extrusion height can cause the object or portions of the object to taper to a point before reaching the extrusion height. Individual loops of a region are always extruded to the same height. When an arc is part of a tapered extrusion, the angle of the arc remains constant, and the radius of the arc changes.

- Angle of taper. Sets an angle between -90 and +90 degrees.
- Specify two points. Sets the taper angle based on two points you specify in the drawing area. The taper angle applied to the extrusion is the distance between the two specified point

Application

Type **Ext** at the Command Prompt → Select Object →enter→ Specify height of extrusion or [Direction/Path/Taper angle] →**T enter(**For Taper Angle) →Put the Value of Taper Angle →Specify height of extrusion or [Direction/Path/Taper angle] →put the Value of Height→ enter



2.2.5. Extrude Faces

You can extrude one or more faces of 3D solid at the specified height and path. Extrude faces command of 3D

There are two options of Extrude faces command

i. Height
ii. Path

APPLICATION (Extrude faces with Height)

Pick tool → select faces → put the Height of extrusion →put the taper angle of extrusion

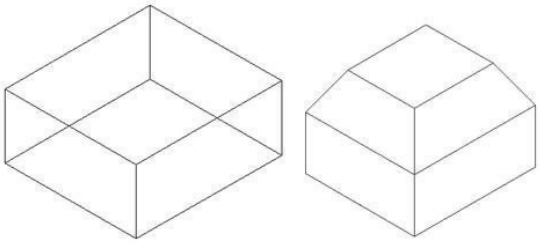


Figure 1 Figure 2

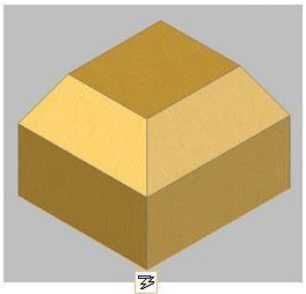
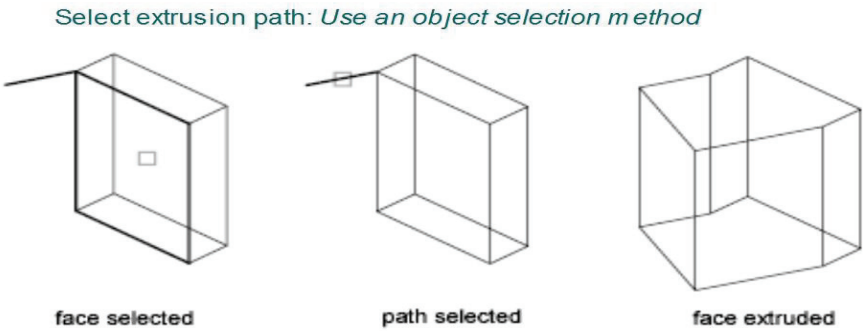


Figure 3

APPLICATION (Extrude faces with Path)

In the first step we draw the path in polyline.

Pick tool → select faces →put the "P" for path option → Select the path



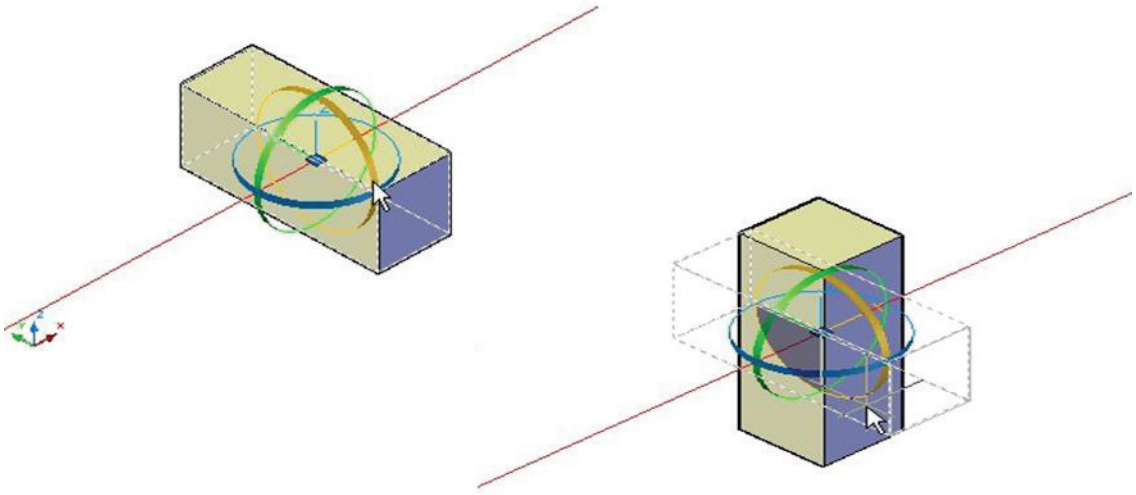
2.2.6. 3D Rotate

3D Rotate command helps to constrain or in rotation of 3D objects and sub-objects along any axis up to a specified angle

APPLICATION

Pick Tool →Select the objects OR hold Ctrl key to select sub-objects (faces, edges, and vertices) →Release Ctrl key and press Enter →The rotate gizmo is displayed attached to the cursor→ Click to place the rotating gizmo, specifying the base point for the move → However the cursor over an axis path on the gizmo until it turns yellow and the vector that represents the axis of rotation is displayed. → Specify angle of the rotation.

When you drag the cursor, the selected objects and sub-objects rotate about the base point along the specified axis. The gizmo displays the degree of rotation from the original position of the object as the object moves. You can click or enter a value to specify the angle of the rotation.



2.2.7. Revolve Command

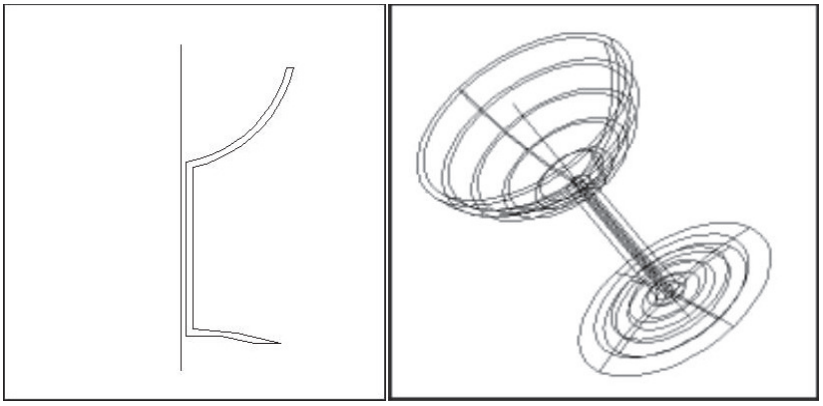
Open profiles create surfaces and closed profiles can create either a solid or a surface. The Mode option controls is a solid of surface is created. When creating a surface. You cannot revolve objects contained within a block or objects that will self-intersect. REVOLVE ignores the width of a polyline and revolves from the center of the path of the polyline. The right-hand rule determines the positive direction of rotation. For more information, see Understand the UCS in 3D.

Through Short Cut Key → Rev enter

Application

Type **Rev** at the Command Prompt →Select Object→enter→ Specify start point for axis of revolution →

Select first point of axis →Select 2nd point of axis→ Specify angle of revolution <360>→put the revolving angle →enter.



- **Revolve Options**

i. Mode
ii. Start Angle
iii. Reverse
iv. Expression

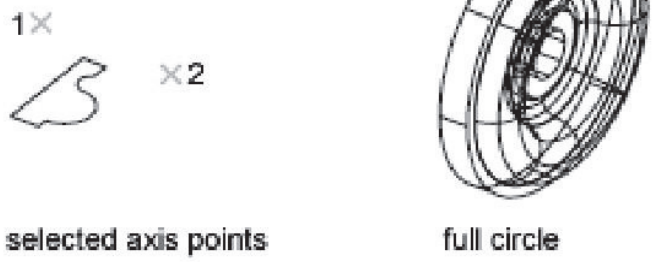
i. Mode

Control whether the revolve action creates a solid or a surface. Surfaces are extended as either NURBS

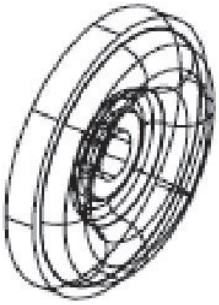
surfaces or procedural surfaces, depending on the SURFACEMODELINGMODE system variable

ii. Start Angle

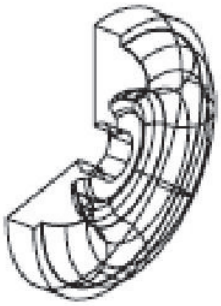
Specify an offset for the revolution from the plane of the object being revolved. Drag your cursor to specify and preview the start angle of the object.



selected axis points



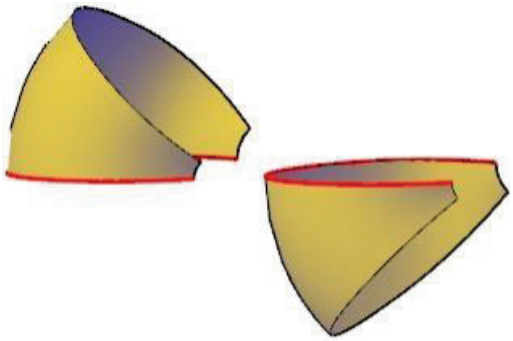
full circle



specified angle

iii. Reverse

Change the direction of the Revolve; similar to entering a - (minus) angle value. The revolved object on the right shows a spline revolved at the same angle as the object on the left, but using the reverse option



iv. Expression

Enter a formula or equation to specify the revolve angle. See Constrain a Design with Formulas and Equations.

2.2.8. Revolves Surfaces

Select a line, arc, circle, or 2D or 3D polyline to sweep in a circular path around a selected axis. Regenerates a three-dimensional model with hidden lines

The MESHTYPE system variable sets which type of mesh are created. Mesh objects are created by default. Set the variable to 0 to create legacy polyface or polygon mesh.

The density of the generated mesh is controlled by the SURFTAB1 and SURFTAB2 system variables. SURFTAB1 specifies the number of tabulation lines that are drawn in the direction of revolution. If the path curve is a line, arc, circle, or spline-fit polyline, SURFTAB2 specifies the number of tabulation lines that are drawn to divide it into equal-sized intervals. If the path curve is a polyline that has not been spline fit, tabulation lines are drawn at the ends of straight segments, and each arc segment is divided into the number of intervals specified by SURFTAB2

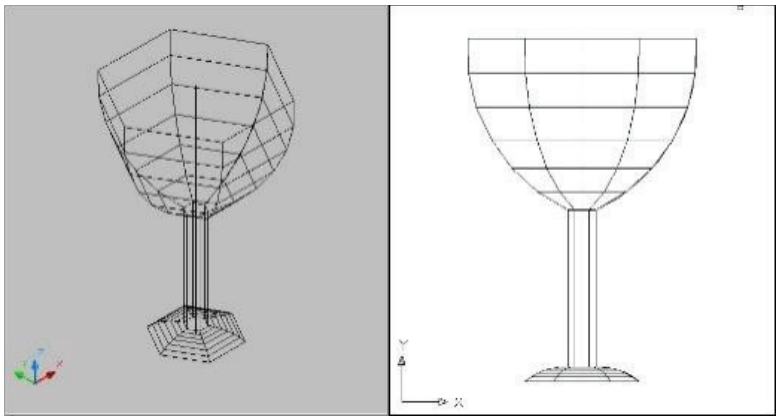
Through Short Cut Key: REVSURF → enter

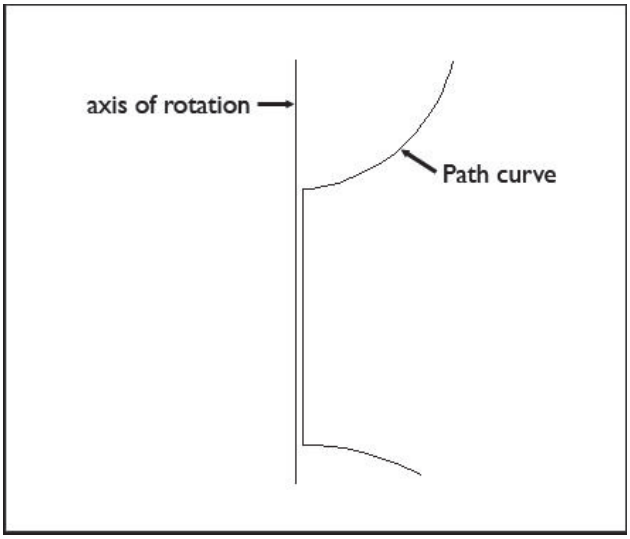
APPLICATION

Type REVSURF at the Command Prompt → Select object to revolve→ Select object that defines the axis of revolution →Specify start angle → Specify included angle →enter

Remember

By default, planar objects are extruded in the direction of the object's normal





2.2.9. Revolve Command

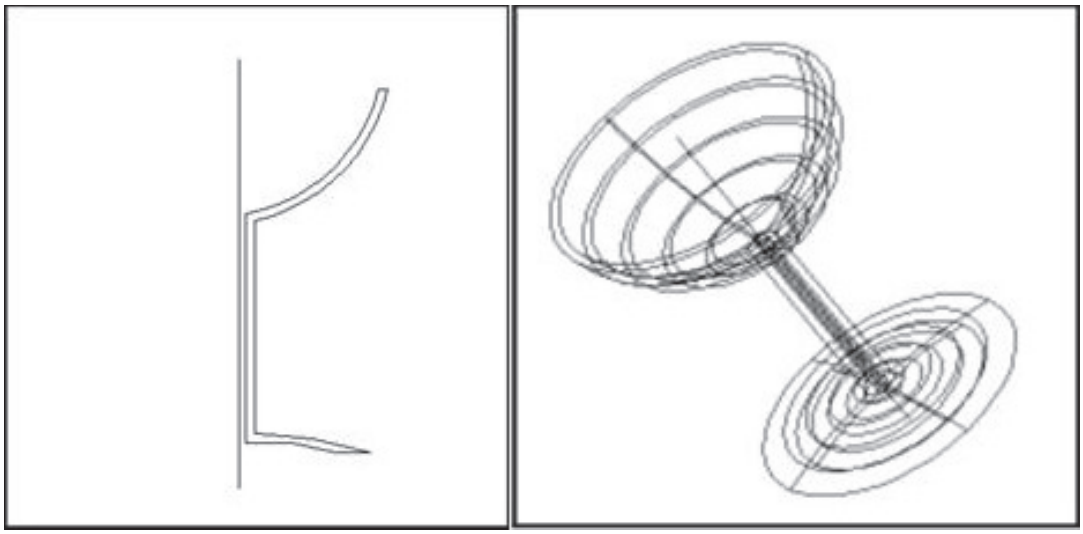
Open profiles create surfaces and closed profiles can create either a solid or a surface. The Mode option controls is a solid of surface is created. When creating a surface. You cannot revolve objects contained within a block or objects that will self-intersect. REVOLVE ignores the width of a polyline and revolves from the center of the path of the polyline. The right-hand rule determines the positive direction of rotation. For more information, see Understand the UCS in 3D.

Through Short Cut Key → Rev enter

Application

Type **Rev** at the Command Prompt →Select Object→enter→ Specify start point for axis of revolution →

Select first point of axis →Select 2nd point of axis→ Specify angle of revolution <360>→put the revolving angle →enter.



- **Revolve Options**

i. Mode
ii. Start Angle
iii. Reverse
iv. Expression

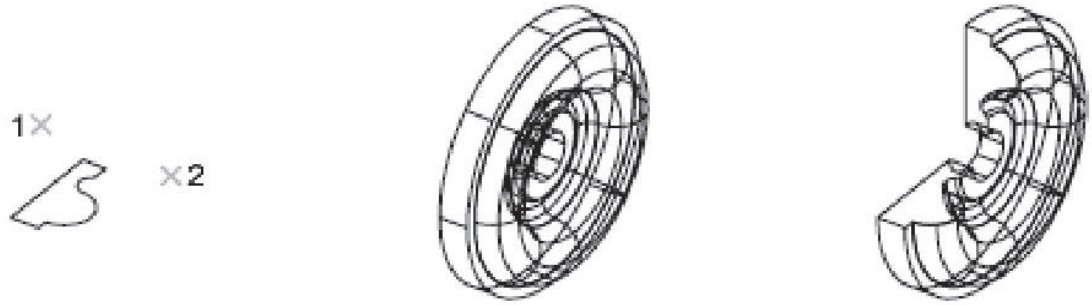
i. Mode

Control whether the revolve action creates a solid or a surface. Surfaces are extended as either NURBS

surfaces or procedural surfaces, depending on the SURFACEMODELINGMODE system variable

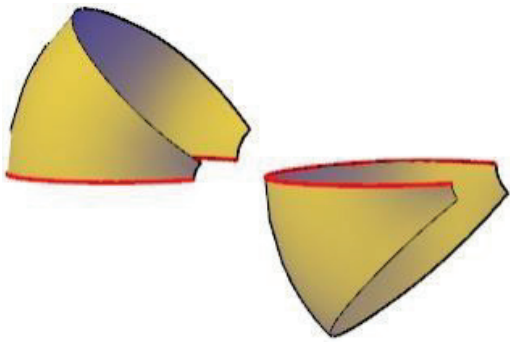
ii. Start Angle

Specify an offset for the revolution from the plane of the object being revolved. Drag your cursor to specify and preview the start angle of the object.



iii. Reverse

Change the direction of the Revolve; similar to entering a - (minus) angle value. The revolved object on the right shows a spline revolved at the same angle as the object on the left, but using the reverse option



iv. Expression

Enter a formula or equation to specify the revolve angle. See Constrain a Design with Formulas and Equations.

2.2.10. Revolves Surfaces

Select a line, arc, circle, or 2D or 3D polyline to sweep in a circular path around a selected axis. Regenerates a three-dimensional model with hidden lines

The MESHTYPE system variable sets which type of mesh are created. Mesh objects are created by default. Set the variable to 0 to create legacy polyface or polygon mesh.

The density of the generated mesh is controlled by the SURFTAB1 and SURFTAB2 system variables. SURFTAB1 specifies the number of tabulation lines that are drawn in the direction of revolution. If the path curve is a line, arc, circle, or spline-fit polyline, SURFTAB2 specifies the number of tabulation lines that are drawn to divide it into equal-sized intervals. If the path curve is a polyline that has not been spline fit, tabulation lines are drawn at the ends of straight segments, and each arc segment is divided into the number of intervals specified by SURFTAB2

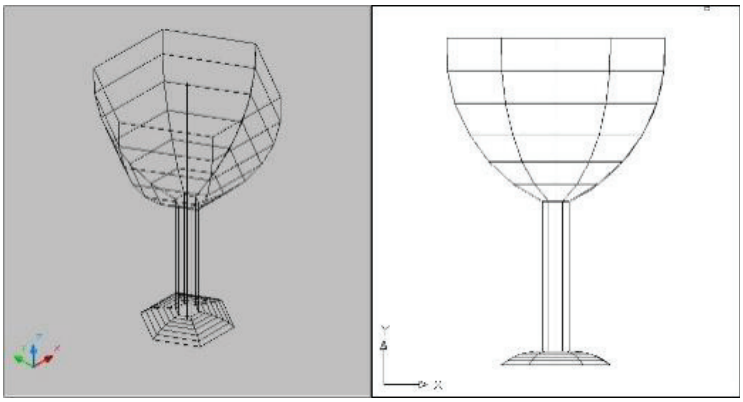
Through Short Cut Key: REVSURF → enter

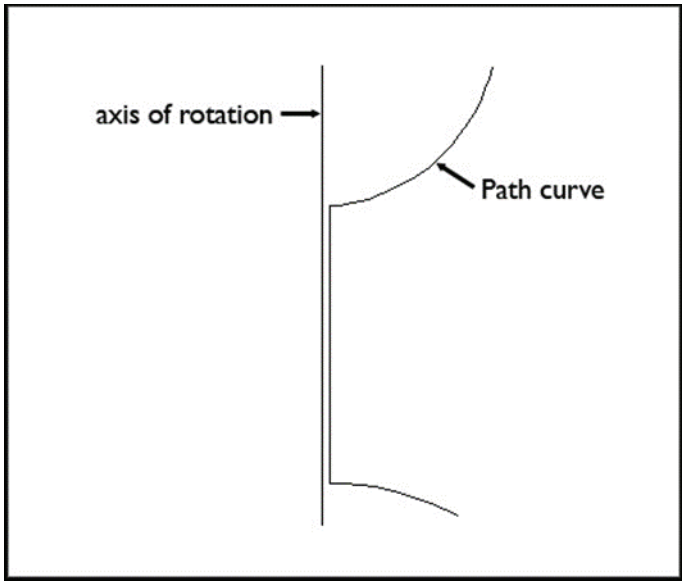
APPLICATION

Type REVSURF at the Command Prompt → Select object to revolve→ Select object that defines the axis of revolution →Specify start angle → Specify included angle →enter

Remember

By default, planar objects are extruded in the direction of the object's normal.





2.2.11. Surftab Variables

Set the number of tabulations for both directions to be generated for RULESURF and TABSURF. Also sets the mesh density in ROTATE3D the M direction for REVSURF and EDGESURF commands.

Method of change the Surftab1&2 values

APPLICATION

i. **SURFTAB 1**

Type **SURFTAB 1** at the Command Prompt → Enter new value for SURFTAB1 <6>:→ Put the new value of Surftab →enter

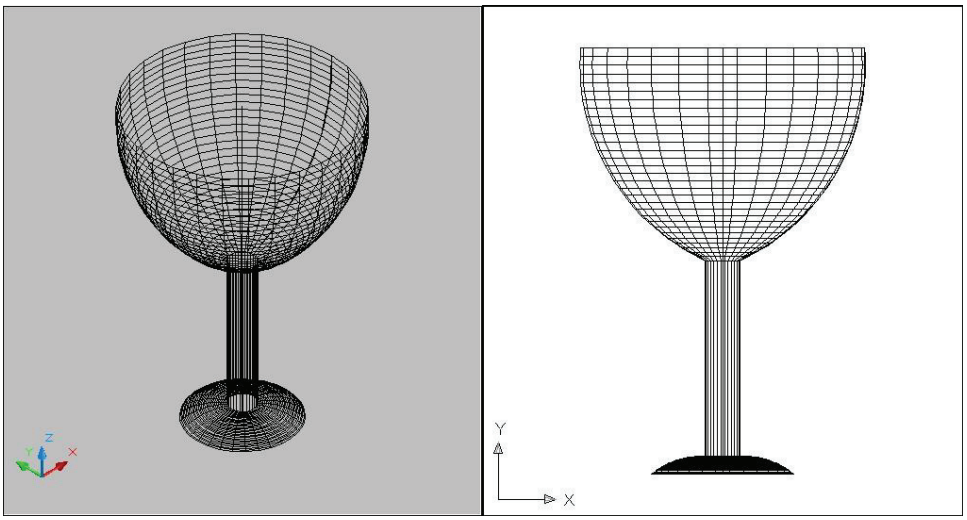
ii. **SURFTAB 2**

Type **SURFTAB 2** at the Command Prompt → Enter new value for SURFTAB2 <6>:→ Put the new value of Surftab →enter

Reaction of Surftab Value on object

APPLICATION

Type REVSURF at the Command Prompt → Select object to revolve → Select object that defines the axis of revolution → Specify start angle → Specify included angle →enter



2.2.12. Shell

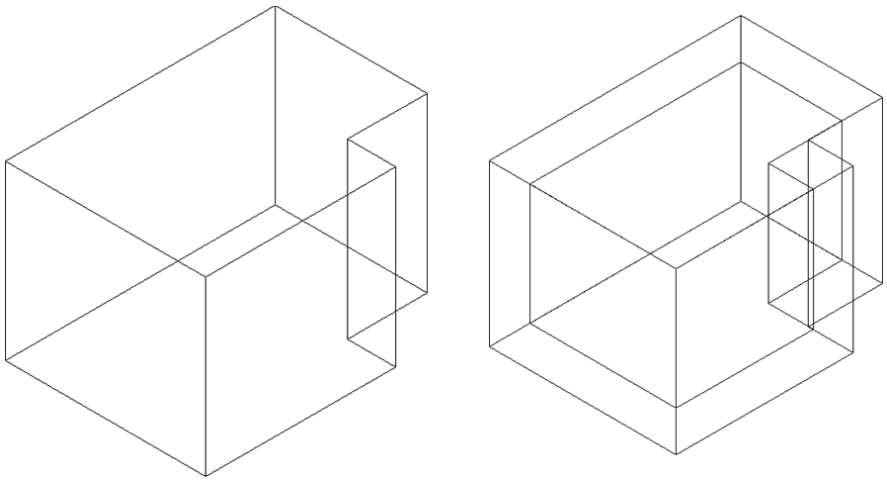
You can create a shell or a hollow thin wall with a specified thickness from your 3D solid object. AutoCAD creates new faces by offsetting existing ones inside or outside their original positions. AutoCAD treats continuously tangent faces as single faces when offsetting.

Choose Modify, Solid Editing, Shell.

Select a 3D solid: pick solid

Remove faces or [Undo/Add/ALL]: enter

Enter the shell offset distance: .5



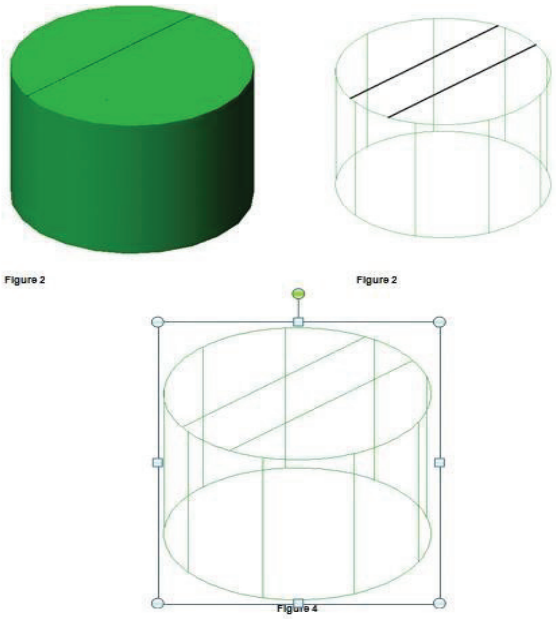
2.2.13. How to Apply “Imprint” Facility on 3D Solid Object

This command is used to imprint an object on the selected solid face. The object to be imprinted must intersect one or more faces on the selected solid in order for imprinting to be successful. Imprinting is limited to the following objects: arcs, circles, lines, 2D and 3D polylines, ellipses, sp lines, regions, bodies, and 3D solids.

APPLICATION

Draw the shape in 2D polylines for imprinting on 3D solid face.

Pick tool → Select 3D object → Select imprint object → delete the source object (Yes/No) → Enter



How to Apply “Shell” command on 3D solid object:
Shell command is used to create a hollow, thin wall structure of a specified thickness. You can specify a constant wall thickness for all the faces. Also the desired faces can be removed as well.

APPLICATION

Pick tool → Select 3D Solid →Select faces to remove → Enter → put the wall thinness Enter

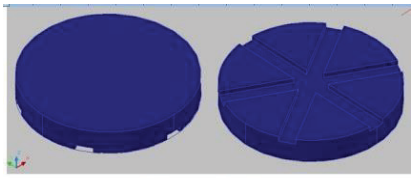


Figure 1(Top & Bottom)

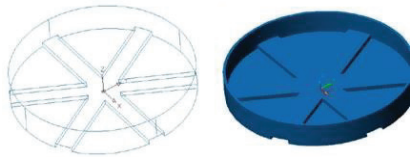


Figure 2 Figure 2

2.2.14. 3D MOVE

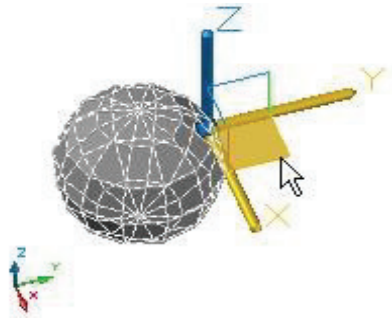
3D move command is used to move a selection set of objects or sub-objects to a specified distance in a specified direction or freely constrain the movement along any axis or plane.

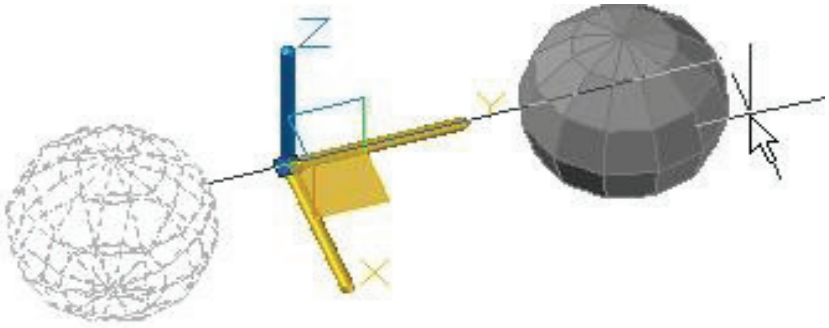
To move selected objects along a plane:

Move the cursor over the planar rectangle that intersects the plan and use to control the plane of constraint. When the rectangle turns yellow, click it.

APPLICATION

Pick Tool →Select the objects OR hold Ctrl key to select sub-objects (faces, edges, and vertices). →Release Ctrl key and press Enter. →The Move gizmo is displayed attached to the cursor →Click to place the Move gizmo, specifying the base point for the move. →Move the cursor over the plane put the specify distance of the move.



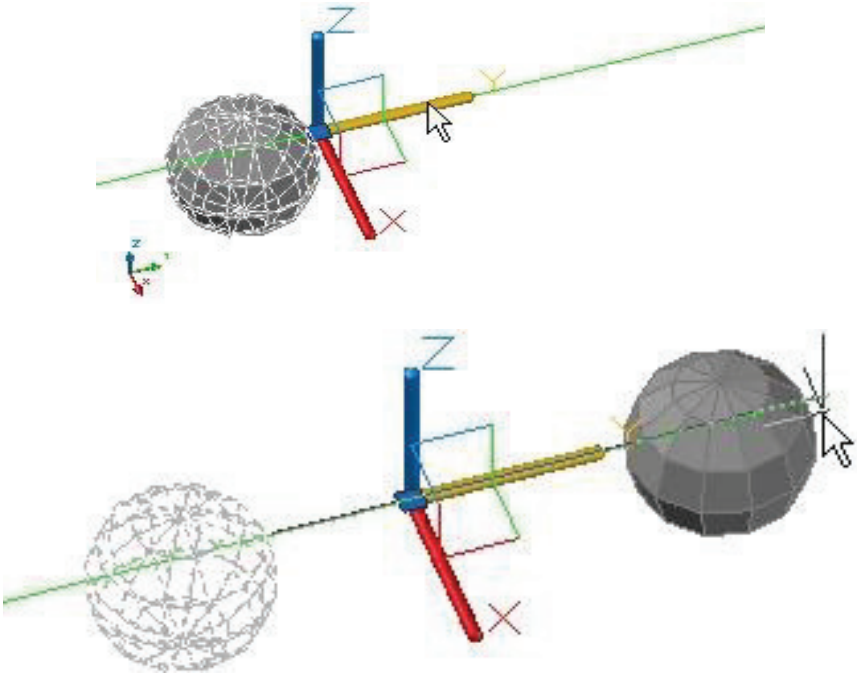


To move selected objects along an axis:

Move the cursor over an axis to control the gizmo until it turns yellow and the vector is displayed. Then click the axis handle

APPLICATION

Pick Tool →Select the objects OR hold Ctrl key to select sub-objects (faces, edges, and vertices). →Release Ctrl key and press Enter. →The Move gizmo is displayed attached to the cursor →Click to place the Move gizmo, specifying the base point for the move. → Handle on the gizmo until it turns yellow and the vector is displayed. Then click the axis handle. →Put the specified distance of the move.



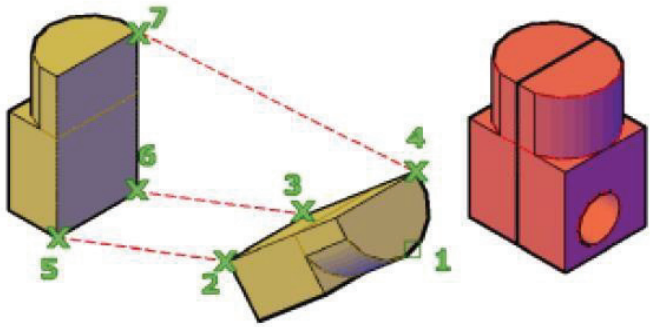
2.2.15. 3D Align Command

You can specify one, two, or three points for the source object. Then, you can specify one, two, or three points for the destination.

Through Short Cut Key → 3Dalign enter

Application

Type 3Dalign at the Command Prompt → Select object → enter →Specify source plane and orientation → Specify base point or [Copy]: →Specify second point or [Continue] →Specify third point or [Continue] → Specify destination plane and orientation →Specify first destination point →Specify second destination point →Specify third destination point



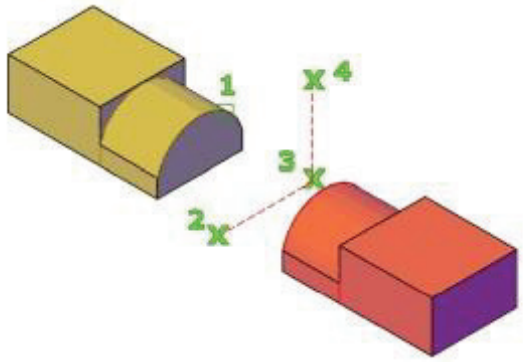
2.2.16. 3D Mirror Command

Create a mirrored copy of selected 3D objects across a mirroring plane. You can specify the mirroring plane by aligning the objects with a specified plane or by specifying three points.

Through Short Cut Key → 3Dmirror enter

Application

Type 3Dmirror at the Command Prompt → Select object → enter →Specify first point of mirror plane (3 points) or[Object/Last/Zaxis/View/XY/YZ/ZX/3points] →Specify second point on mirror plane →Specify third point on mirror plane →Delete source objects? [Yes/No] <N>→ enter.



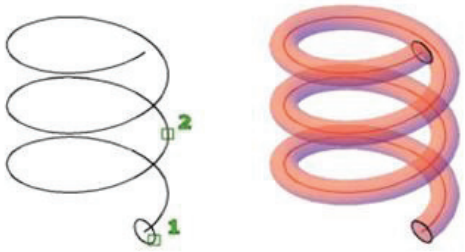
2.2.17. Sweep Command

Creates a solid or surface by sweeping an open or closed, planar or non-planar curve (profile) along an open or closed path. Open curves create surfaces and closed curves create solids or surfaces, depending on the specified mode. You can use the following objects and paths when creating a swept solid or surface:

Through Short Cut Key → Sweep enter

Application

Type Sweep at the Command Prompt →Select Object to sweep →enter →Select sweep path →enter

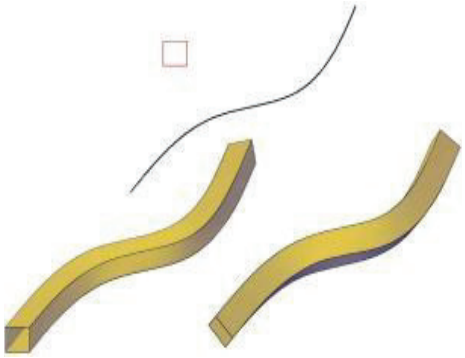


- **Sweep Options**

i. Alignment
ii. Base point
iii. Scale
iv. Twist

i. Alignment

Specify whether the profile is aligned to be normal to the tangent direction of the sweep path. If the profile is not perpendicular (normal) to the tangent of the start point of the path, then the profile automatically aligns. Enter No at the alignment prompt to prevent this.



ii. Base point

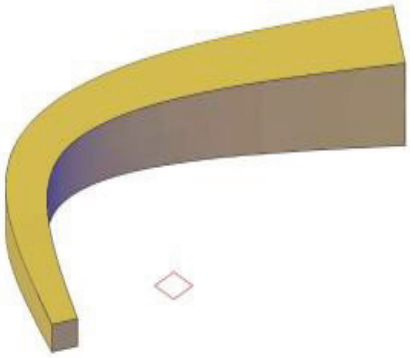
Specify a base point for the objects to be swept.

iii. Scale

Specify a scale factor for a sweep operation. The scale factor is uniformly applied to the objects that are swept from the start to the end of the sweep path.

Remember

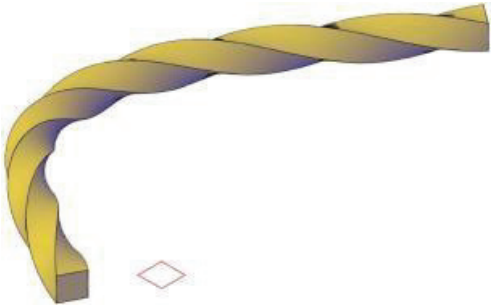
Scale the selected objects based on the length you reference by picking points or entering values.



iv. Twist

Set a twist angle for the objects being swept. The twist angle specifies the amount of rotation along the entire length of the sweep path.

Specify whether the curve(s) being swept will naturally bank (rotate) along a 3D sweep path (3D polyline, spline, or helix).



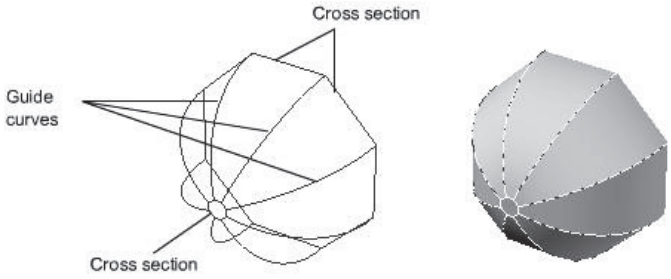
2.2.18. Loft Command

LOFT command creates a solid by joining several crass sections lying on different planes. The cross sections define the profile (Shape) of the resulting solid. Cross sections (generally, curves or circle).Loft draws a solid in the space among the different cross sections. You must specify at least two cross sections when you use the LOFT command.

Through Short Cut Key → Loft enter

Application

Type Loft at the Command Prompt → Select cross-sections in lofting order →Select Cross sections →enter



Cross sections with guide curves

Lofted solid

- **Loft Command Options**

i. Guides
ii. Path
iii. Cross sections only
iv. Settings

i. Guides

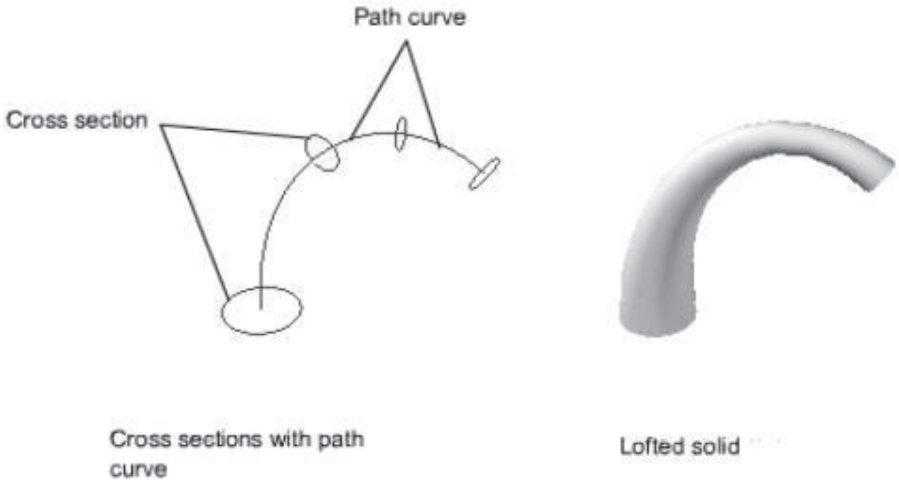
Specifies guide curves that control the shape of the lofted solid or surface. You can use guide curves to control how points are matched up on corresponding cross sections to prevent undesired results, such as wrinkles in the resulting solid or surface.

- Intersects each cross section
- Starts on the first cross section
- Ends on the last cross section

Select any number of guide curves for the lofted surface or solid and press Enter

ii. Path

Specify a path for the loft operation to obtain more control over the shape of the lofted object. For best results, start the path curve on the plane of the first cross section and end it on the plane of the last cross section.

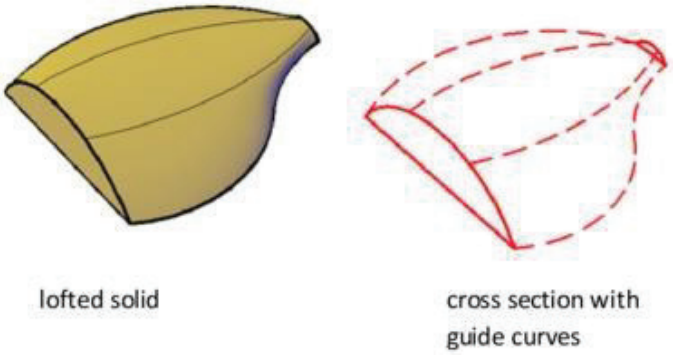


iii. Cross-section

Select a series of cross-section profiles to define the shape of the new 3D object. Lofted objects with different cross-section settings as you create a lofted object; you can adjust its shape by specifying how the profile passes through the cross sections (for example, a sharp or smooth curve). You can also modify the settings later in the Properties Inspector.

iv. Guide Curves.

Specify guide curves to match points on corresponding cross sections. This method prevents undesired results, such as wrinkles in the resulting 3D object.



Each guide curve must meet the following criteria

- Intersects each cross section
- Starts on the first cross section
- Ends on the last cross section

2.3. Demonstrate Different Views to View the Objects (Preset Views, Viewports, Visual Styles, PeSSPective Projection and Parallel Projection, Orbits, Etc.)

While working in 3D, there are many ways to change how you view your drawing. Views are seen by the "camera" - equivalent to your eye. The camera is located in a specific place and faces a specific direction There are several standard orthographic and isometric views, and if you need additional peSSPective you
can change how the camera is oriented. You can move the camera using the **Move Camera** commands, and dynamically examine the model using the **Walk Through** tools. To save and display additional views, you can create camera objects.

Tip: If you use a wheel mouse, keep the middle mouse button pressed, and drag the cursor around the screen to dynamically rotate the model.

2.3.1. Preset Views

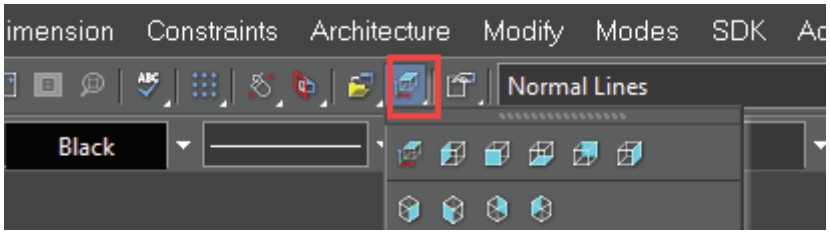
The view is the area of the drawing space that appears on your screen. As your drawing becomes larger and more complex, it's important to find views that let you work at the right location in your drawing, at an appropriate level of detail.

Tip: Layers are a useful way to change how objects. You can place objects on various layers and then manipulate layer visibility.

- **Saving 3D Views**

  You can use camera objects to save views with specific parameters and open them in their own windows.

  The ten standard views can be accessed from the **View / Camera** menu.



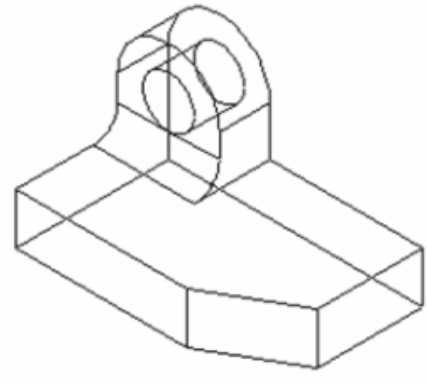
  You can also display this toolbar separately by right-clicking in the toolbar area and selecting **Standard Views**.

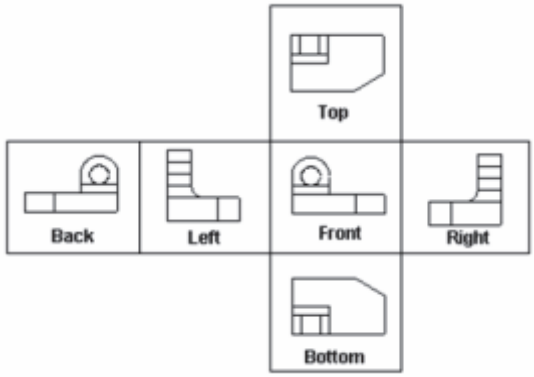
  And, by default, these tools are available on the local (right-click) menu.

- **Orthographic Views**

  The first six views on the toolbar are orthographic views - Top (World Plan), Left, Front, Bottom, Back, Right.
  If your model was enclosed in a box, these views reflect how the model would appear by

looking directly at each of the box faces. If you "unfold" the box, you can see the relationship between the views.





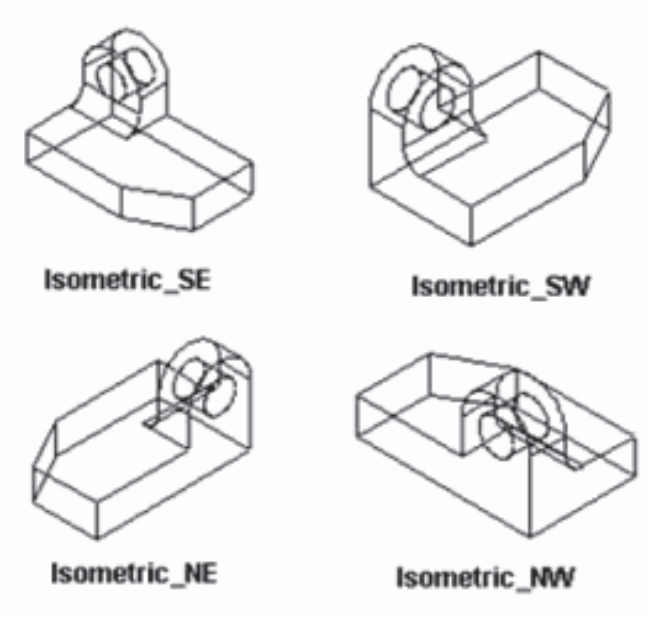
Front View: Looks at the XZ plane of the World Coordinate System, while facing +Y.
Top View: Looks at the XY plane while facing- Z (down).

Tip: The **Top** view can be also obtained from the **Plan** view by using the **Roll** walk through tool.

Left View: Looks at the YZ plane while facing +X.
Bottom View: Looks at the XY plane while facing +Z (up).
Back View: Looks at the XZ plane while facing -Y.
Right View: Looks at the YZ plane while facing -X.

- **Isometric Views**

  The last four views on the toolbar are isometric - angled views. The views are named for compass directions (Isometric_SE is the view looking from the southeast).

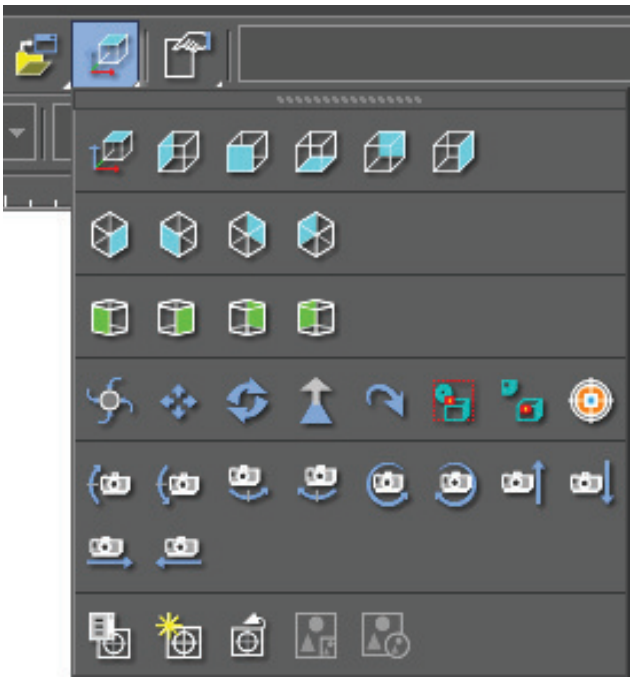


- **Procedure of Saving Views**

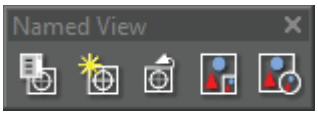
  Once you have used the zoom and pan tools to arrive at the exact view of your drawing that you want, you won't want to repeat all that work to get back to the same view later. You can save views and assign them names so that you can easily return to a saved view at any time.
  In addition, saved views must be created if you want to create viewports in Paper Space.

  Note: For 3D views, you can also use camera object to save and display views in separate windows and with specific parameters.

  The **Named Views** tools are accessible from the **View** menu, or from the fly out **World Plan** icon on the **Standard** toolbar.



You can display the **Named Views** toolbar by right-clicking in any toolbar area and select **Named View**.

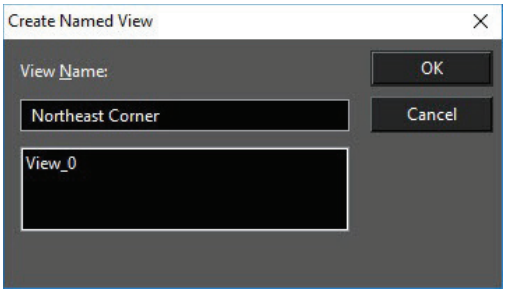


Note: Saved views can also be accessed and manipulated in the Design Director, in which you can also create new views. Render and camera settings can be manipulated here as well.

- **Creating a View**

  Default UI Menu: View/Named Views/Create View

  Saves a defined area of the screen as a named view. Define the rectangle that surrounds the area you want to save. In the **Create Named View** window, assign a unique name and click OK.

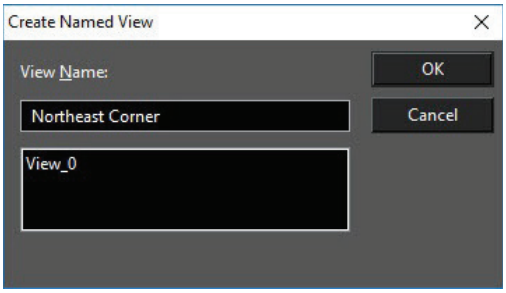


Note: If the drawing is already oriented to the view you want to save (i.e. you do not need to define a view rectangle), you can save the view using the **Named View** tool.

Named View

Default UI Menu: View/Named Views/Named View

The **Named View** window can be used to create a new saved view, or to display, modify, or delete a saved view.



Named views are saved with your drawing and remain available unless you delete them.
Draft Rendering: Sets the rendering type when the view is rendered in **Draft** rendering mode.
Quality Rendering: Sets the rendering type when the view is rendered in **Quality** rendering mode.

PeSSPective: Activates **PeSSPective** mode.
Angle: The view angle for peSSPective mode.
Position: The location of the camera position.
Target: The location of the point the camera is facing.
UP Vector: A point defining the up direction of the camera.
Extents: The boundaries of the view.

- **Saving a View**

i. Use the zoom and pan tools to arrive at the view you want to save.

Note: If you want to create a view using a specific area of the screen.

ii. Select **Named View** from the menu or click the **Named View** icon to open the **Named View** window.

iii. Enter a name for the view. The name can be up to 32 characters in length and can include spaces.

iv. Click **New** to add the name to the list of named views.

Tip: Give the view a descriptive name that will help you remember it, such as "Garden Door." If you use names like "View 1" and "View 2," you'll quickly lose track of which is which.

- **Displaying a Saved View**

In the **Named View** window, select the desired view and click **Go To**. This will leave the window open, in case you want to switch to another view. To immediately go to a named view and close the window, double-click on the view name.

Tip: If you want to display the previous view, use **View / Zoom / Previous View**.

Modifying a Saved View

Use the zoom and pan tools to arrive at the view with which you want to replace a saved view. Open the **Named View** window, select the view you want to replace with the current drawing view, and click **Modify**.

Deleting a Saved View

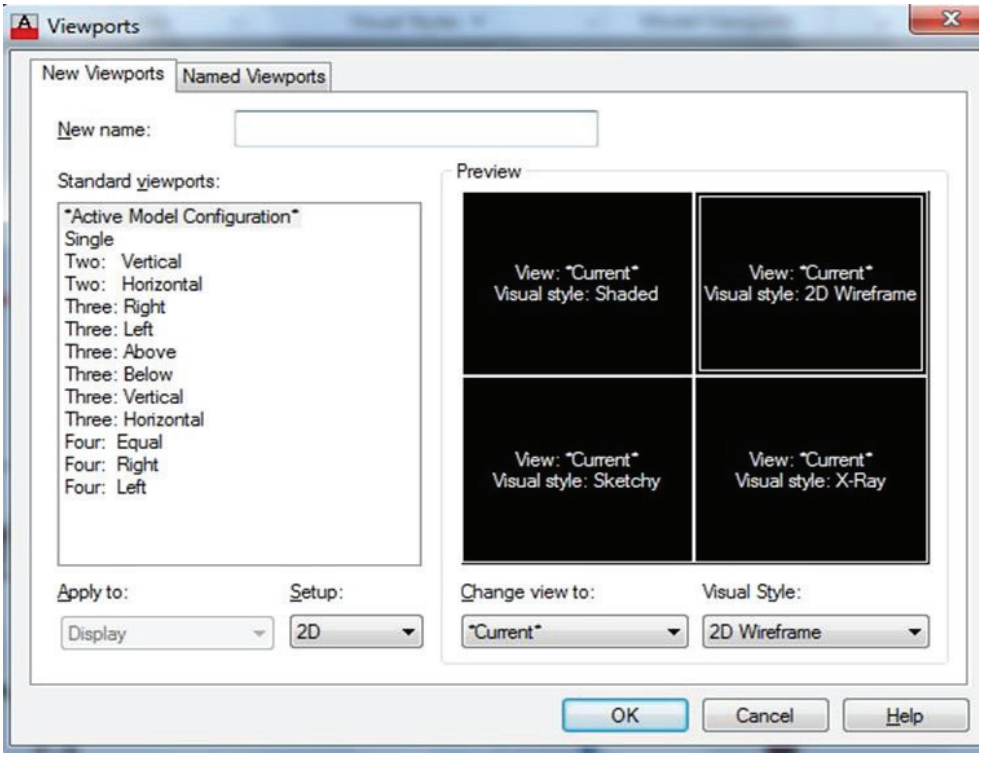
In the **Named View** window, select the view you want to delete, and click **Delete**.

2.3.2. Preset 3D Viewports: -

You can used Command to split the windows: by typing the **VPORTS** command in command line.

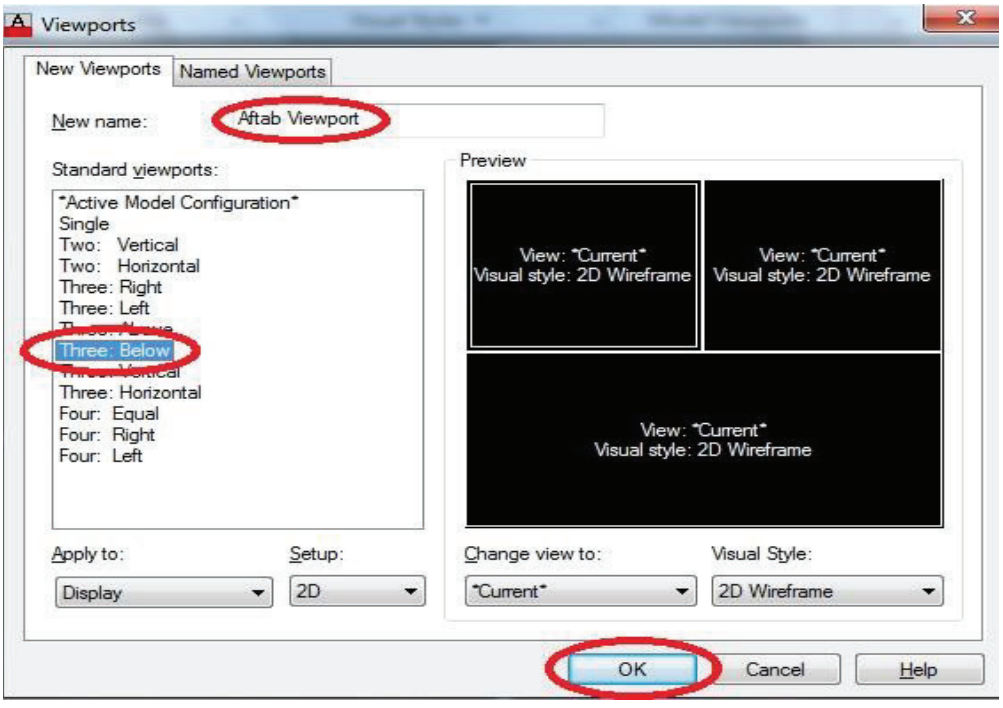
Step-1: Type: VPORTS

You will get the following figure

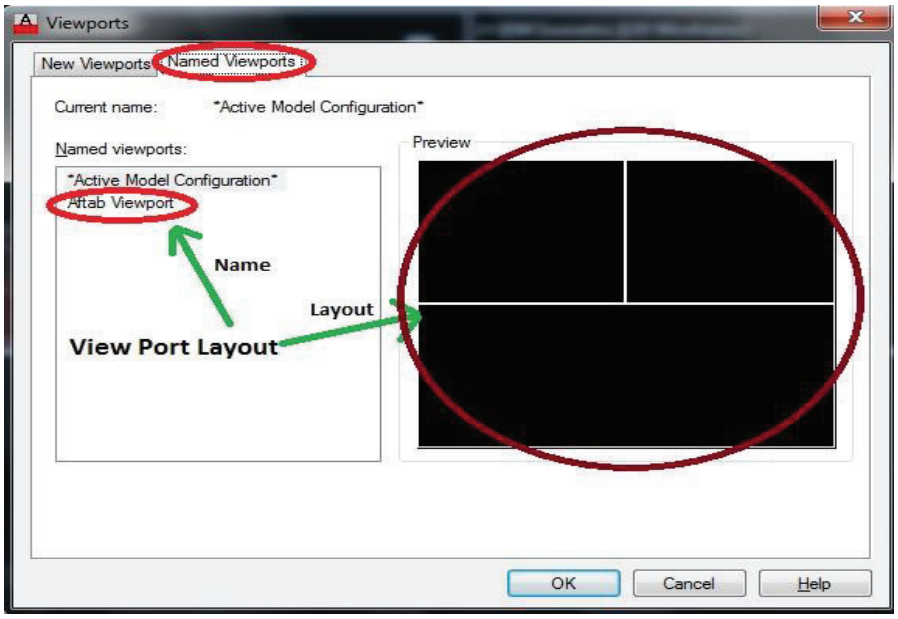


Step-2: Type the name for the new model space viewport

i. If you do not enter a name, the viewport configuration is applied but not saved.
ii. If a viewport configuration is not saved, it cannot be used in a layout.
iii. If you specify a name it can be save and can be used in a layout.



Step-3: Whenever you used the viewport again you will get the layout named Aftab Viewport as shown in figure below

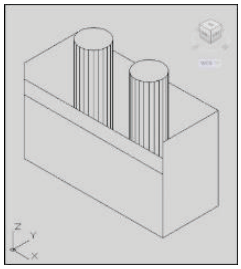


2.3.3. Visual Style: -

Different styles are used to display/visualize in the drawing area, these maybe as under

- **2D Wireframe**

  On applying this visual style, all hidden lines will be displayed along with the visible lines in the model. Sometimes, it becomes difficult to recognize the visible lines and hidden lines, if you set this visual style for complex models.

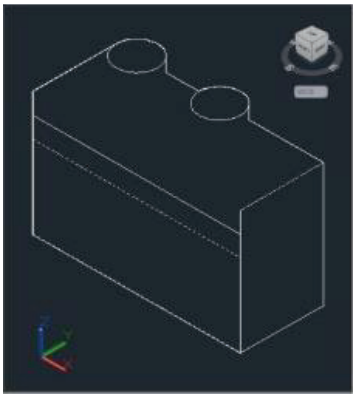


- **Conceptual**

  In this visual style, the model will be displayed as shaded and the edges of the visible faces of the model will also be displayed.

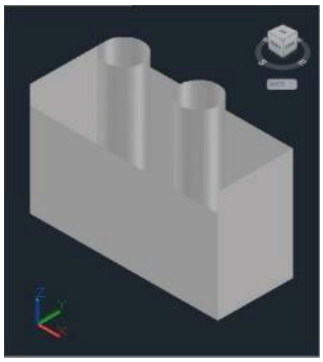
- **3D Hidden**

  On applying this visual style, the hidden lines in the model will not be displayed, and only the edges of the faces that are visible in the current viewport will be displayed.



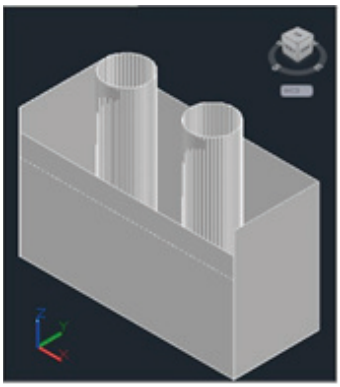
- **Realistic**

  This visual style is the same as **Conceptual**, but with a more realistic appearance. Moreover, if materials are applied to a model, this visual style will display the model along with the material applied.



- **Shaded**

  In this visual style, smooth shading is applied to the faces of a model. In this case, the edges of the visible faces are not visible.

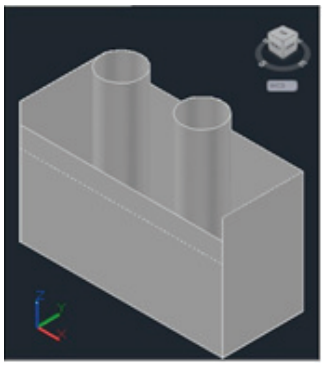


- **Shaded with edges**

  In this visual style, smooth shading is applied to the faces of a model and the edges of the visible faces are visible.

- **Shades of Gray**

  In this visual style, a single shade (grey) is applied to all faces of a model.

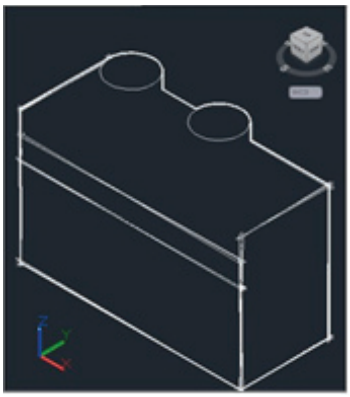


- **Sketchy**

  In this visual style, a model appears as if it is hand sketched.

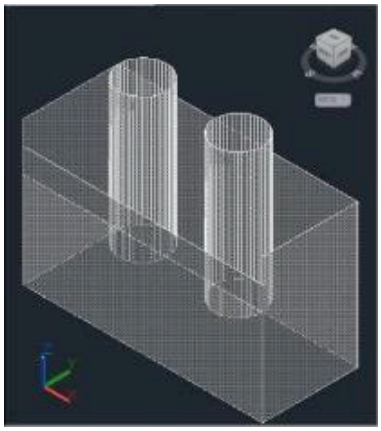
- **Wireframe**

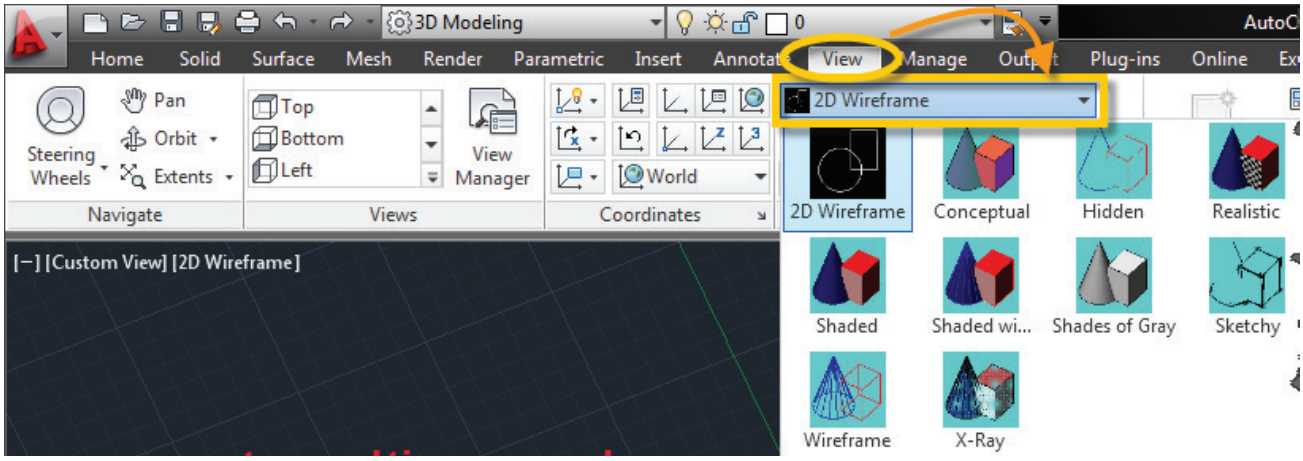
  This visual style is used to display a solid model as a wireframe model. You can see through the solid model while the model is being rotated in the 3D orbit view.



- **X-Ray**

  This visual style is used to display the model with shading and mild transparency. In this case, the hidden lines will be visible.





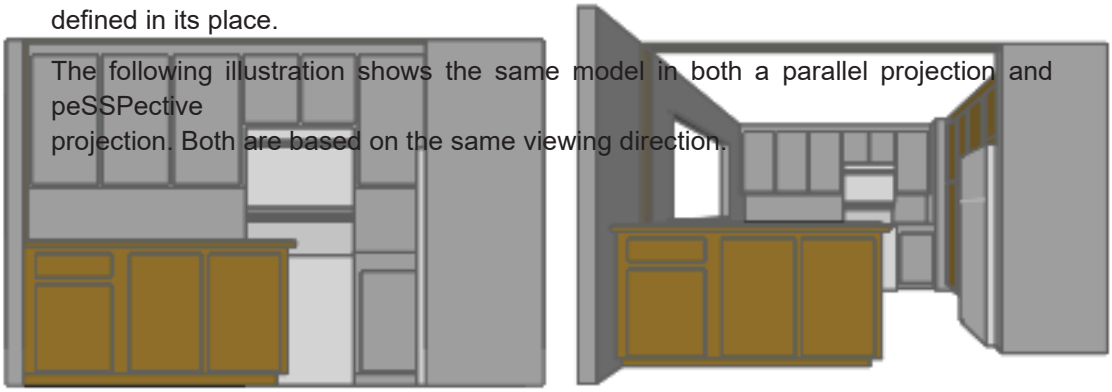
2.3.4. PerSSPe projection and parallel projection

you can create realistic visual effects in a drawing by defining either parallel or peSSPective
projections of a model.

The difference between peSSPective views and parallel projections is that peSSPective views require
a distance between a theoretical camera and target point. Small distances produce severe peSSPective effects; large distances produce mild effects.

A peSSPective view remains in effect until the peSSPective effect is turned off or until a new view
is
defined in its place.

The following illustration shows the same model in both a parallel projection and peSSPective
projection. Both are based on the same viewing direction.



Parallel projection Perspective projection

2.3.4.1. Define Parallel Projections

To determine the point or angle in model space, you can

i. Choose a preset 3D view from the View toolbar.
ii. Enter a coordinate or angles that represent your viewing location in 3D.
iii. Change to a view of the XY plane of the current UCS, a saved UCS, or the WCS.
iv. Change the 3D view dynamically with your pointing device.
v. Set front and back clipping planes to limit the objects being displayed.

Viewing in 3D is available only in model space. If you are working in paper space, you cannot use 3D viewing commands such as VPOINT, DVIEW, or PLAN to define paper space views. The view in paper space is always a plan view.

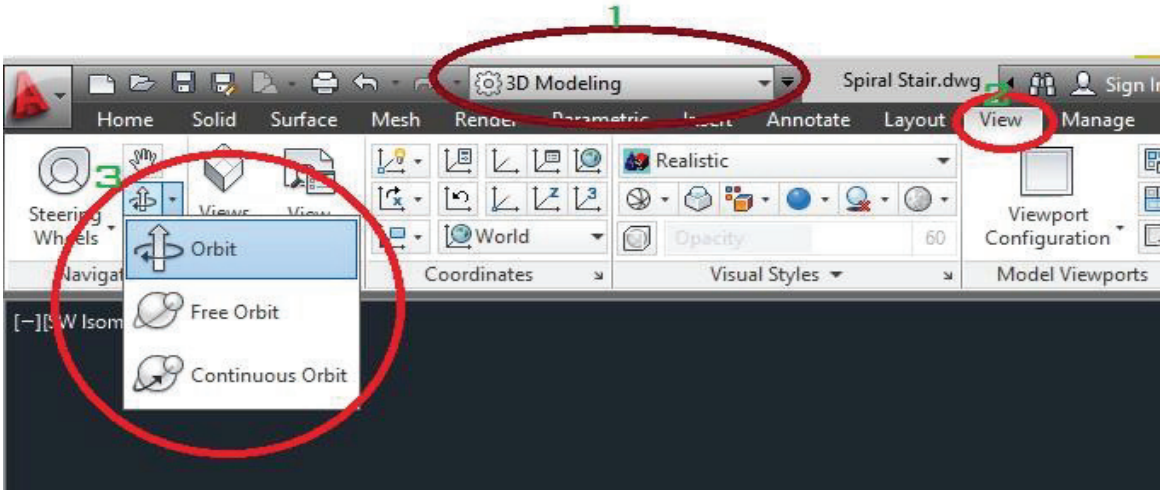
2.3.4.2. Dview Command

Type **DV** at the Command Prompt → Select first set of objects or [Nested selection/Settings] →Select solids →enter.

2.3.5. Orbits

3D Orbit is used to view the selected object/s (Selection must be apply before the command of 3D Orbit) or the entire drawing within the current viewport from any angle.

When 3DOrbit is active, the target of the view stays stationary and the camera location, or point of view, moves around the target. However, from the user's point of view, it appears as if the 3D model is turning as the mouse cursor is dragged. In this way, you can specify any view of the model This unit describes familiarity with AutoCAD 3D Orbit and its different types. After completion of this learning unit, you will be able to work with "3DOrbit" command for constrained orbit on selected object and on whole drawing as well. You will also be able to provide due assistance in developing zoom (Extends, window etc.) and pan facility and apply different projection mode Parallel and PeSSPective option with respect to fly and walk orbiting to explore the use of orbiting.



Sr. #	Name	Command	Description
1	Orbit	Orbit/3dorbit	Constrains orbiting to the XY plane or the Z direction.
2	Free Orbit	3dforbit	Allows orbiting in any direction, without being constrained to the XY plane or the Z direction.
3	Continuous Orbit	3dcorbit	Changes the cursor to a sphere with two continuous lines encircling it and enables you to set the objects into continuous motion.

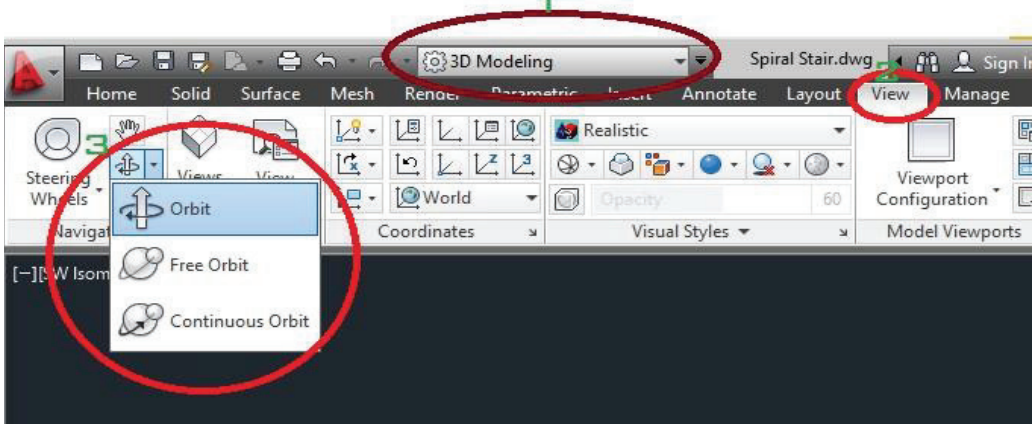
2.3.5.1. Introduction to 3D Orbit

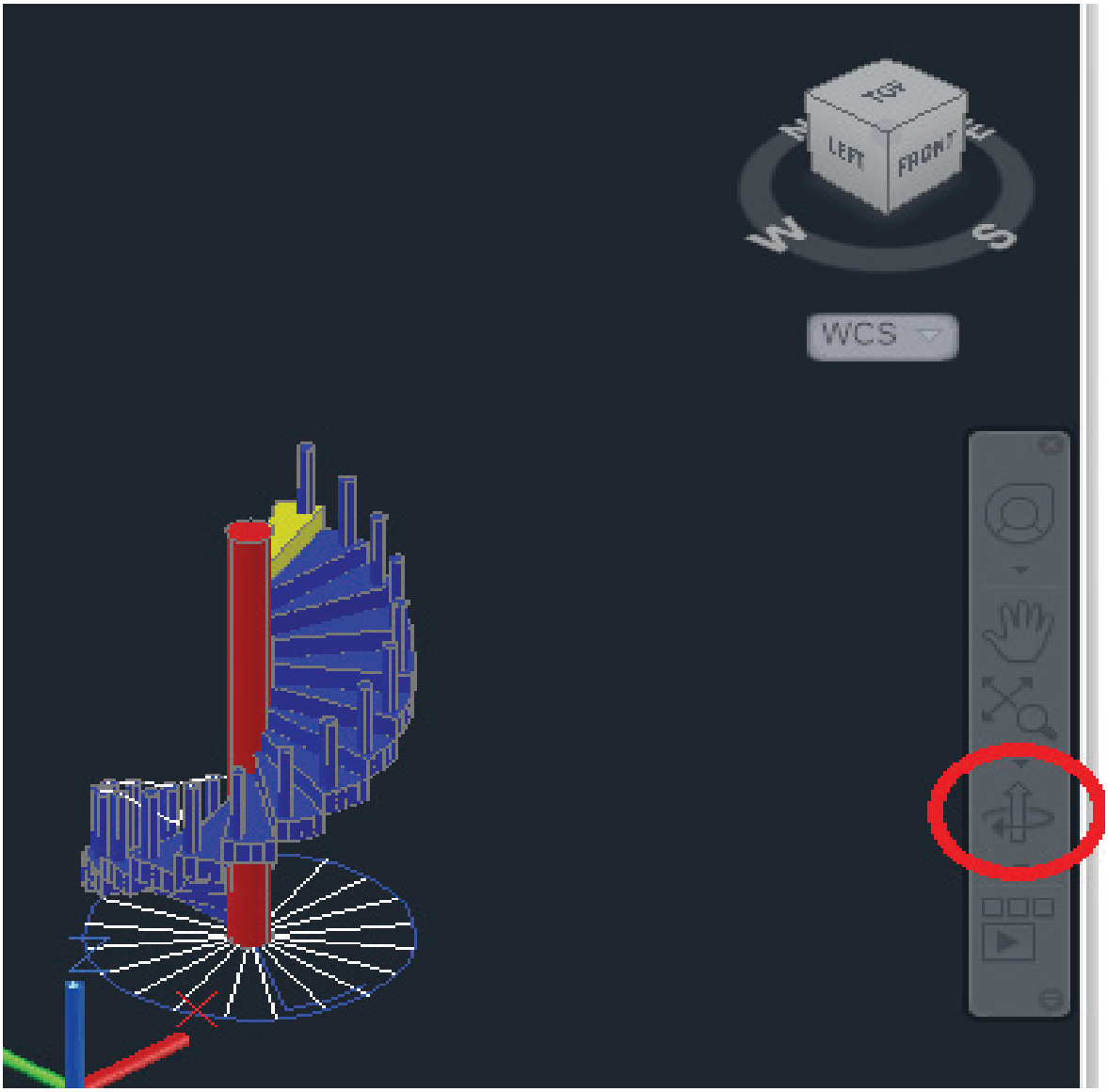
3D Orbit is used to view the selected object/s (Selection must be applying before the command of 3D Orbit) or the entire drawing within the current viewport from any angle.

When 3DOrbit is active, the target of the view stays stationary and the camera location, or point of view, moves around the target. However, from the user's point of view, it appears as if the 3D model is turning as the mouse cursor is dragged. In this way, you can specify any view of the model.

You can activate the 3D Orbit by the following methods:

View Tab	Button	Command Entry
Orbit		3dorbit





There are nine types of Orbiting, which may be used during orbiting.

You can get the first three orbits from **3D Modelling → View→ Navigate**

While other will you get from other Navigation option from shortcut menu, during the orbiting process as you will see later in this unit.

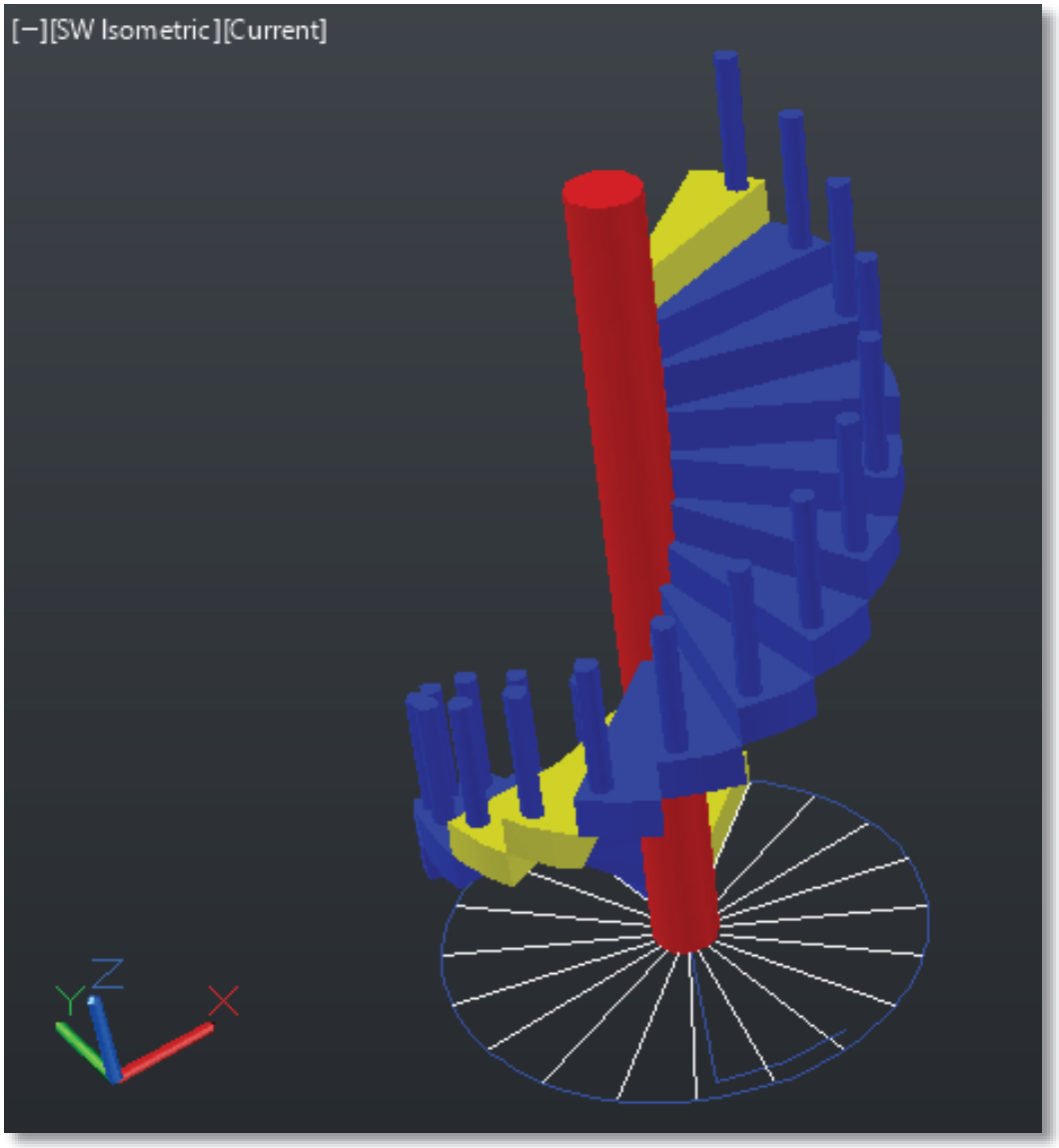
Sr#	Name	Command	Description
1	Orbit	Orbit/3dorbit	Constrains orbiting to the XY plane or the Z direction.
2	Free Orbit	3dforbit	Allows orbiting in any direction, without being constrained to the XY plane or the Z direction.
3	Continuous Orbit	3dcorbit	Changes the cursor to a sphere with two continuous lines encircling it and enables you to set the objects into continuous motion.
4	Adjust Distance	3DDISTANCE	Simulates moving the camera closer to the object or farther away.
5	Walk	3DWALK	Changes the cursor to a plus sign and enables you to "walk through" a model at a fixed height above the XY plane, by dynamically controlling the location and target of the camera. Walk orbit works only in peSSPective view
6	Swivel	3DSWIVEL	Changes the cursor to an arched arrow and simulates the effect of swiveling the camera.
7	Fly	3DFLY.	Changes the cursor to a plus sign and enables you to "fly through" a model without being restricted to a fixed height above the XY plane. Fly orbit works only in peSSPective view
8	Zoom	3DZOOM	Changes the cursor to a magnifying glass with plus (+) and minus (-) sign and simulates moving the camera closer to an object or further away. Works like the Adjust Distance option.
9	Pan	3DPAN	Changes the cursor to a hand cursor and moves the view in the direction that you drag.

2.3.5.2. Procedure Apply Orbiting to Drawing

STEP BY STEP Operations on AutoCAD

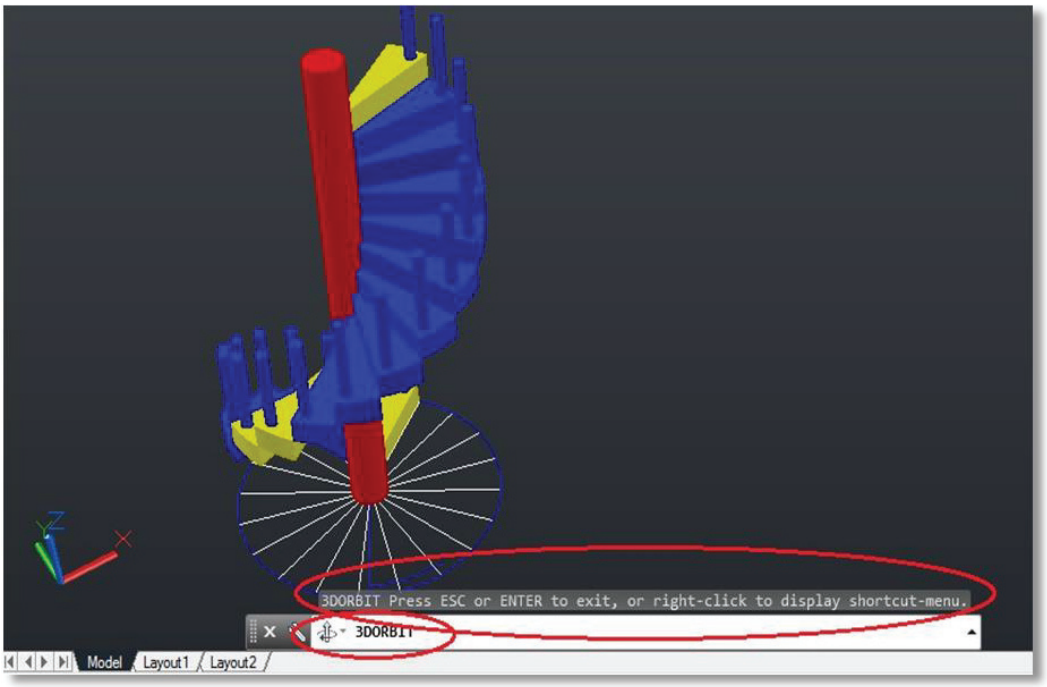
GET READY. Before you going to begin these steps, make sure to set unit and you must have objects in your drawing.

We are going to apply 3D Orbit on the following drawing as shown in the figure below.



Step-1: Type orbit/3dorbit command in command bar <Enter>

Step-2: You can orbit/revolve the drawing according to XY plane or the Z direction During any orbiting you can get other functions as shown below:



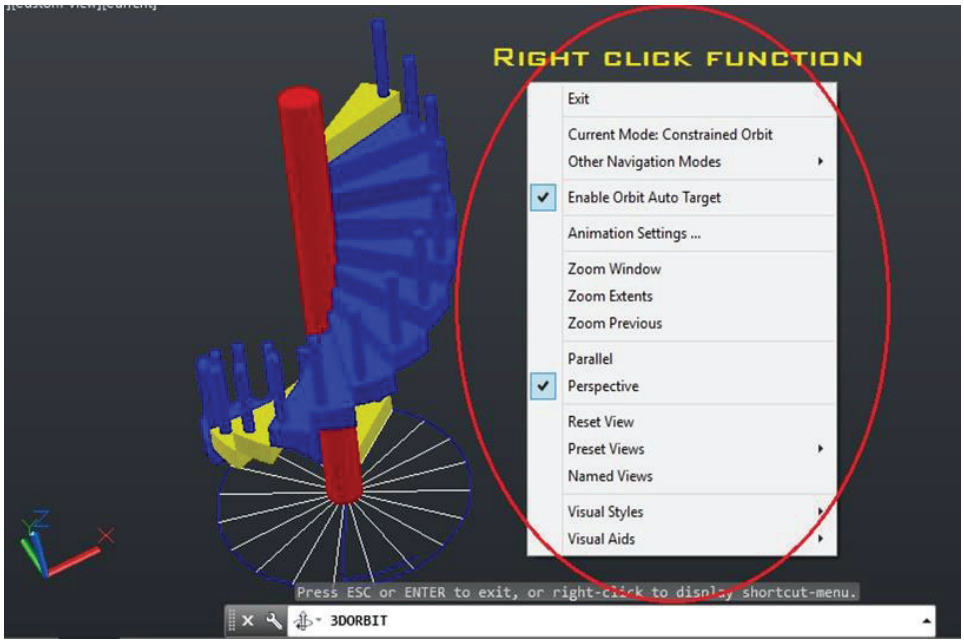
Whenever you apply any orbit, you will get the option “Press ECS or ENTER to exit or right-click to display shortcut-menu”.

- **Use of ECS Button**

  When you press ECS button during orbiting, as the name describe ECSAPE, you will get release or exit from the orbit command, and will get ready to prompt other commands of AutoCAD

- **Use of Right Click**

  Whenever you right-click during orbiting you will get the following shortcut-menu as shown in the figure below

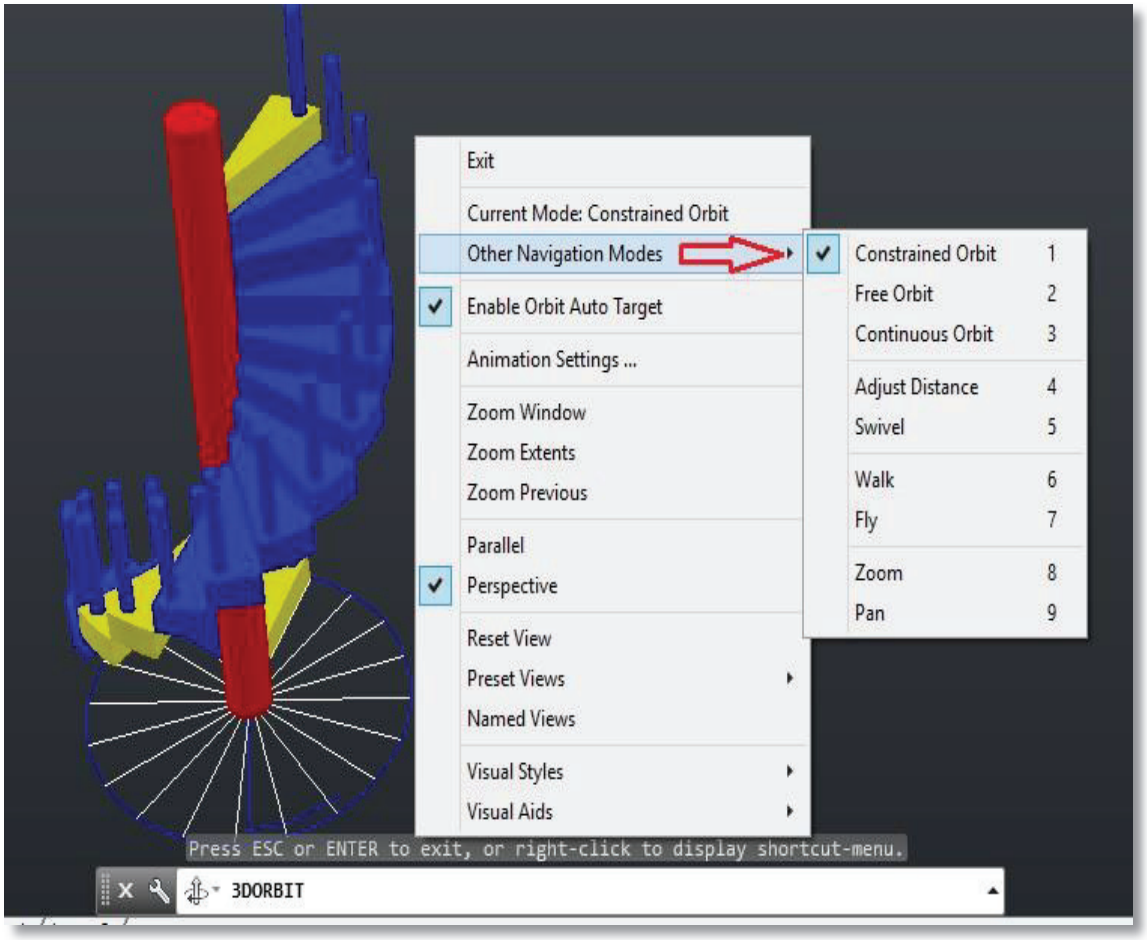


2.3.5.3. Discover Other Navigational Modes

As we discussed other navigation from where you can get the nine orbiting types as shown in the figure below.

Step-1: Type orbit/3dorbit command in command bar <Enter>

Step-2: Right click at the drawing area, you will get the following



2.3.5.4. 3D Orbit on Selected Object

3D Orbit on selected object/s allows you to orbit / revolve the specific object within the drawing.

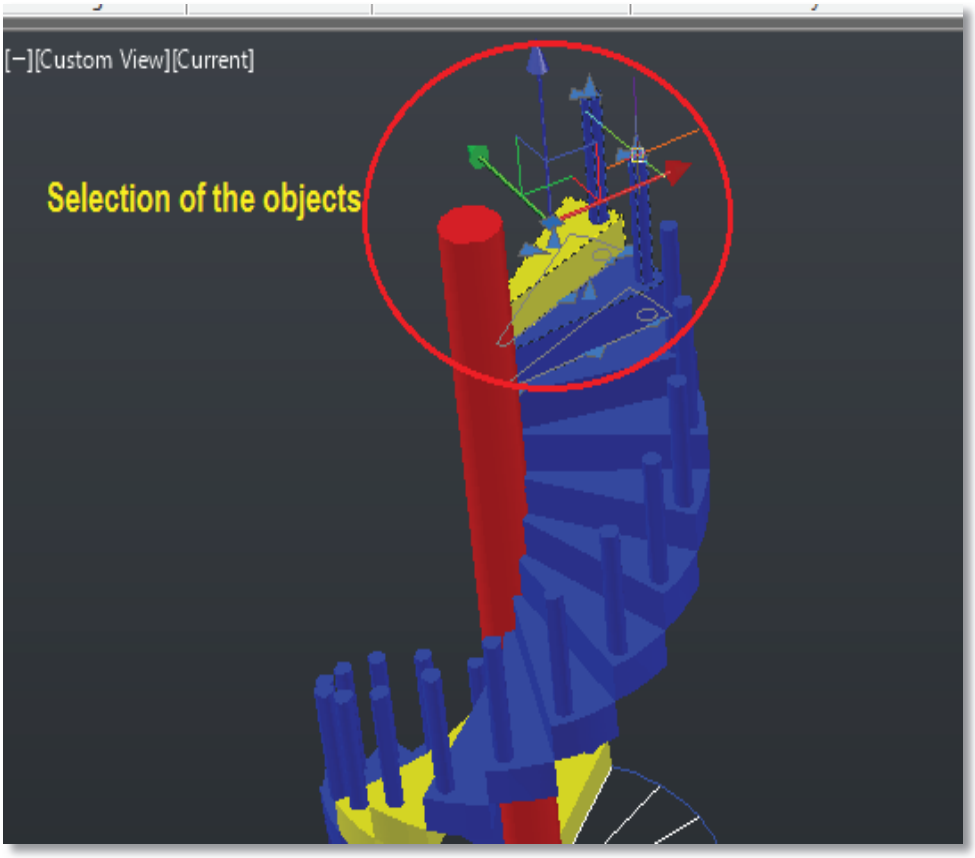
- **Procedure Apply Orbiting to Drawing**

  STEP BY STEP Operations on AutoCAD

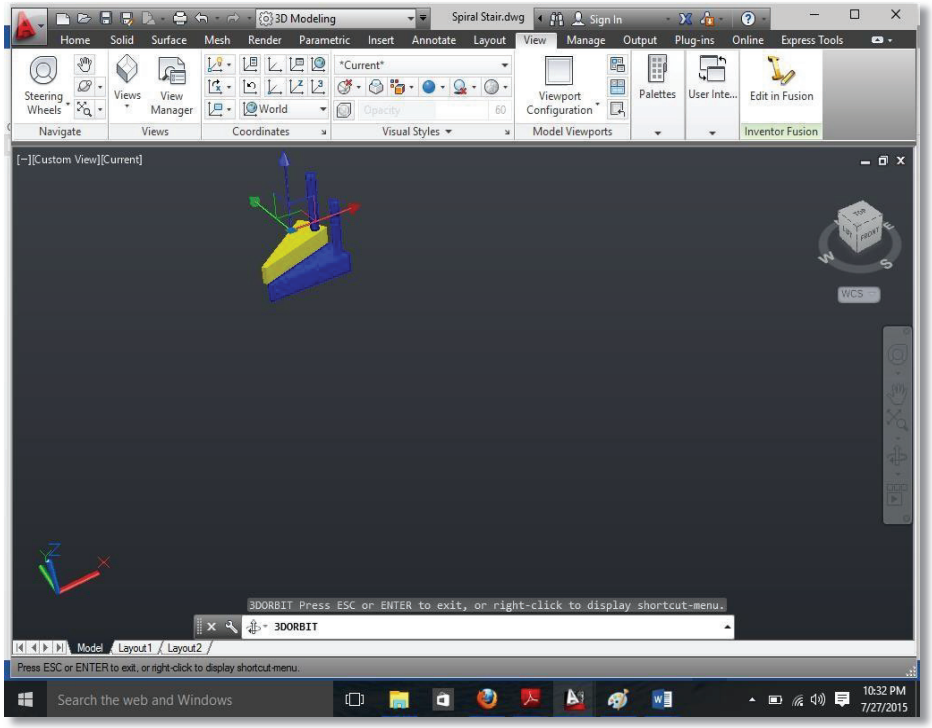
  GET READY. Before you going to begin these steps, make sure to set unit and you must have objects in your drawing.

  We are going to apply 3D Orbit on the following selected object within the drawing as shown in the figure below

Step-1: Select the object before applying the orbit command, as shown here



Step-2: Type orbit/3dorbit command in command bar <Enter> you will get the only selected object to orbit as shown in the figure below



Step-3: You can orbit/revolve the drawing according to XY plane or the Z direction.

Step-4: When you press ECS button, you will get display the whole drawing again.

2.3.5.5. Developing Pan and Zoom in 3D Orbit

You can easily develop Zoom and Pan command during orbiting, the function of zoom and pan as the same as we discussed in previous module, but the only difference is to get Zoom and Pan after applying the orbit command then orbit/revolve that area

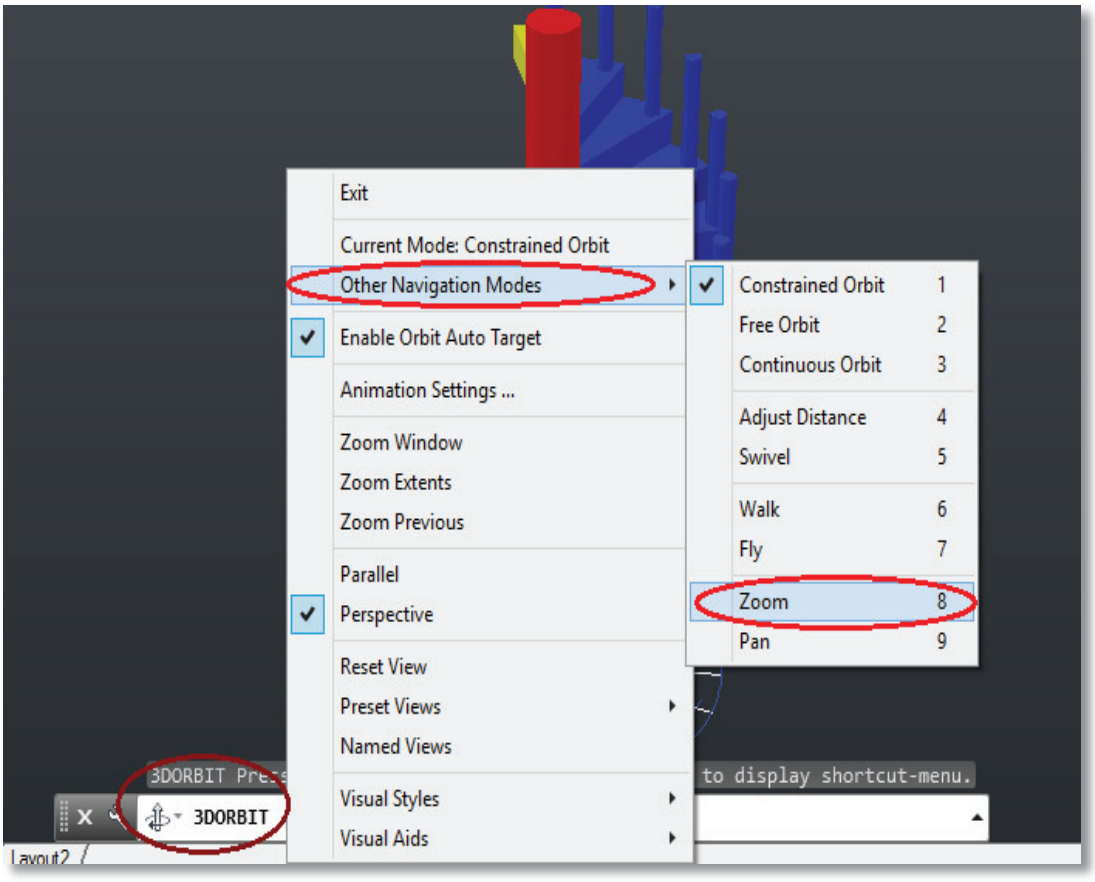
3D Orbit on selected object/s allows you to orbit / revolve the specific object within the drawing.

- **Procedure Developing Pan and Zoom in 3D Orbit**

Step-1: Type orbit or any other orbit command in command bar <Enter>

Step-2: Right click at the drawing area.

Step-3: Go through Other Navigational Mode →zoom as shown in figure below



Step-4: Zoom-In or Zoom-Out the object or drawing.

Step-5: Then Right click again at the drawing area.

Step-6: Go through Other Navigational Mode →constrained Orbit and continuing to orbiting as you need.

Step-7: Repeat step-1 to step-6 for Pan and get the Pan functions

- **Alternate Method for 3D Orbit Zoom**

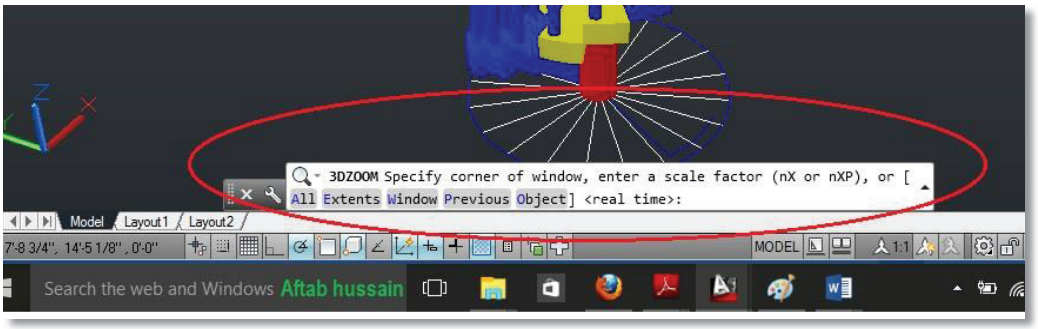
  You can also get all zooming option (extent, window, previous etc.) During orbiting by using direct command.

  Command to Enter: **3DZOOM**

  Step-1: Type 3dzoom command in command bar <Enter>, you will get the following.

Remember

All Zooming option work the same as we discussed in Previous Modules, if you need just glance back to the previous modules.



Step-2: From here you can apply any of the zoom command as shown in the options to orbit the drawing or object/s

2.3.5.6. Different Visual Styles in 3D Orbit

In previous module we already discussed Visual Styles in detail but here we are going to get practice on Visual styles in 3D Orbit peSSPective.

Visual styles composites of the following styles in 3D Orbit.

i. 2D Wireframe
ii. Conceptual
iii. Hidden
iv. Realistic
v. Shaded
vi. Shaded with edges
vii. Shaded of Gray
viii. Sketch of Gray
ix. Wireframe
x. X-ray

- **Procedure Apply Visual Styles in 3D Orbit**

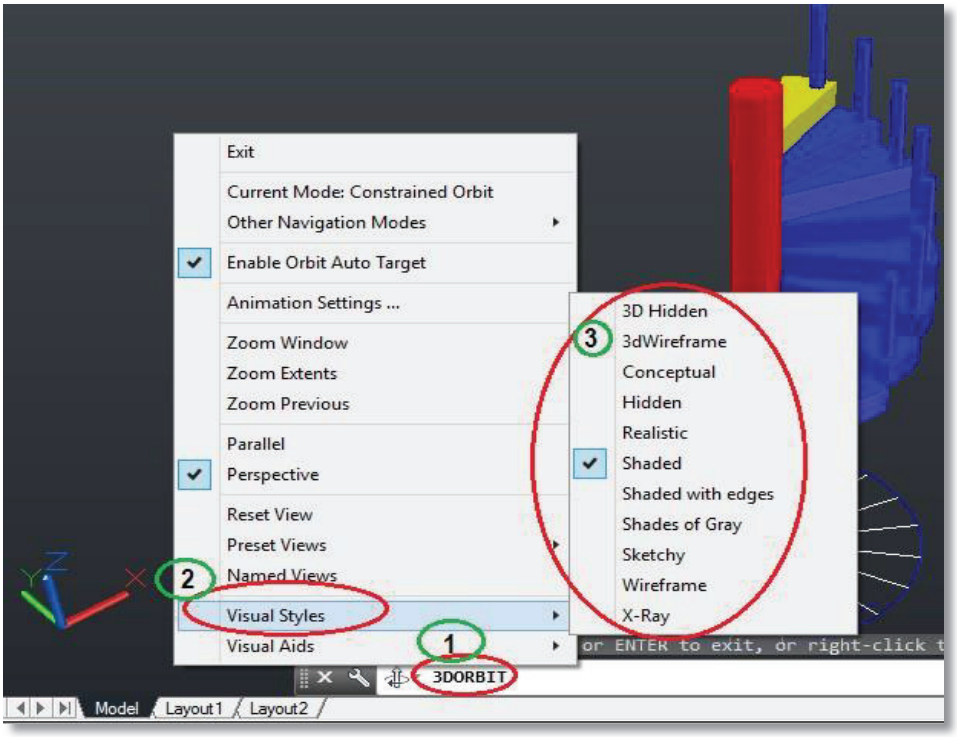
  STEP BY STEP Operations on AutoCAD

  GET READY. Before you begin these steps, be sure to set unit and you must have an object in your drawing to apply visual styles on it.

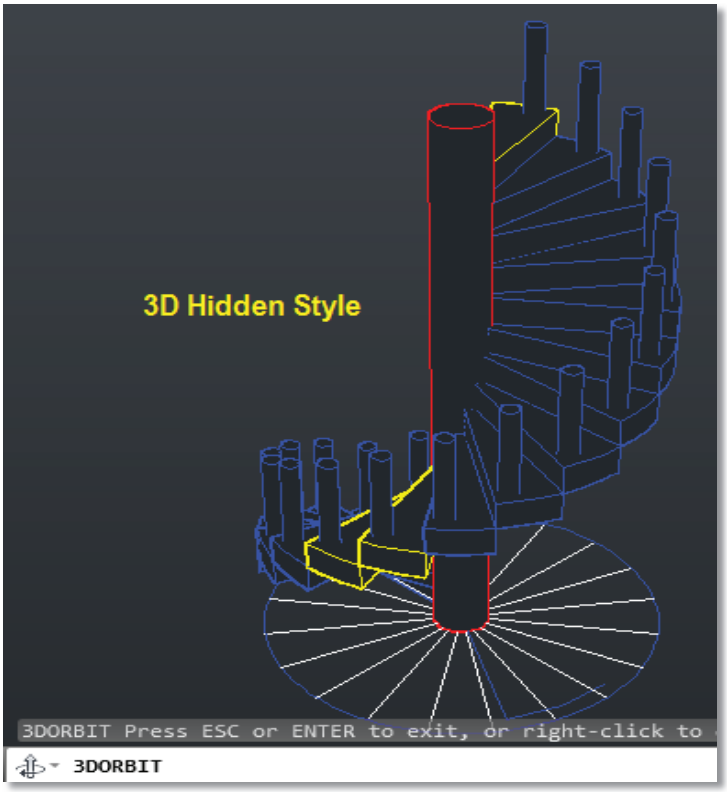
Step-1: Type **3dorbit** command in command bar **<Enter>**

Step-2: Right click in the drawing area.

Step-3: Go through **Visual styles** from the Popup menu as shown in the figure below.

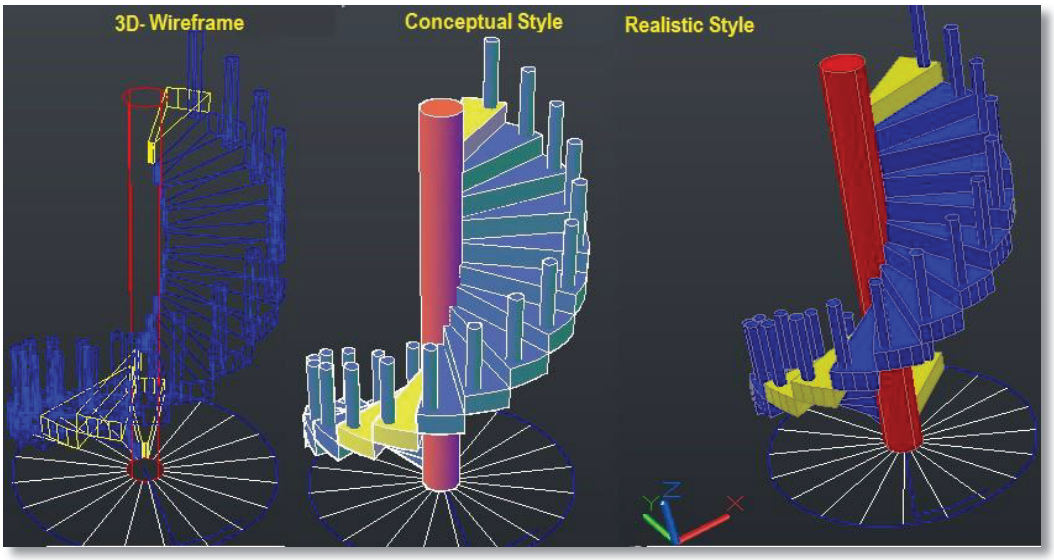


Step-4: Select **3D Hidden** Styles, You will get the following figure below



Step-5: Repeat

Step-4 for getting different visual styles in 3D Orbits. The following figures shown different visual styles:



2.3.5.7. Walk and Fly

You can simulate walking and flying through a 3D drawing.

When you walk through a model, you travel along the XY plane. When you fly through a model, you are not constrained by the XY plane, so you appear to “fly” over an area in a model.

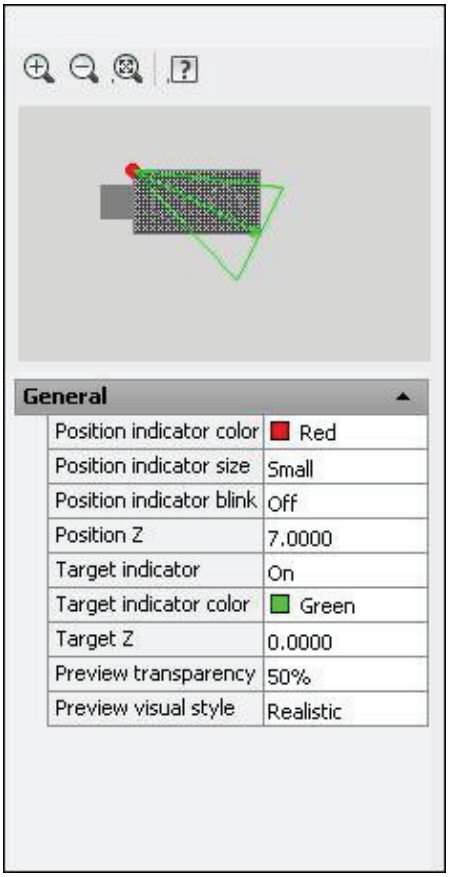
Walk and Fly Navigation modes for the keyboard and mouse.

i.	Up arrow or W key	=	Move forward
ii.	Down arrow or S key	=	Move backward
iii.	Left arrow or A key	=	Move left
iv.	Right arrow or D key	=	Move right
v.	Drag mouse	=	look around and turn

Step-1: Open a drawing with 3D objects and display in a 3D view

Step-2: Crate a camera anywhere in the drawing and set the view to that camera

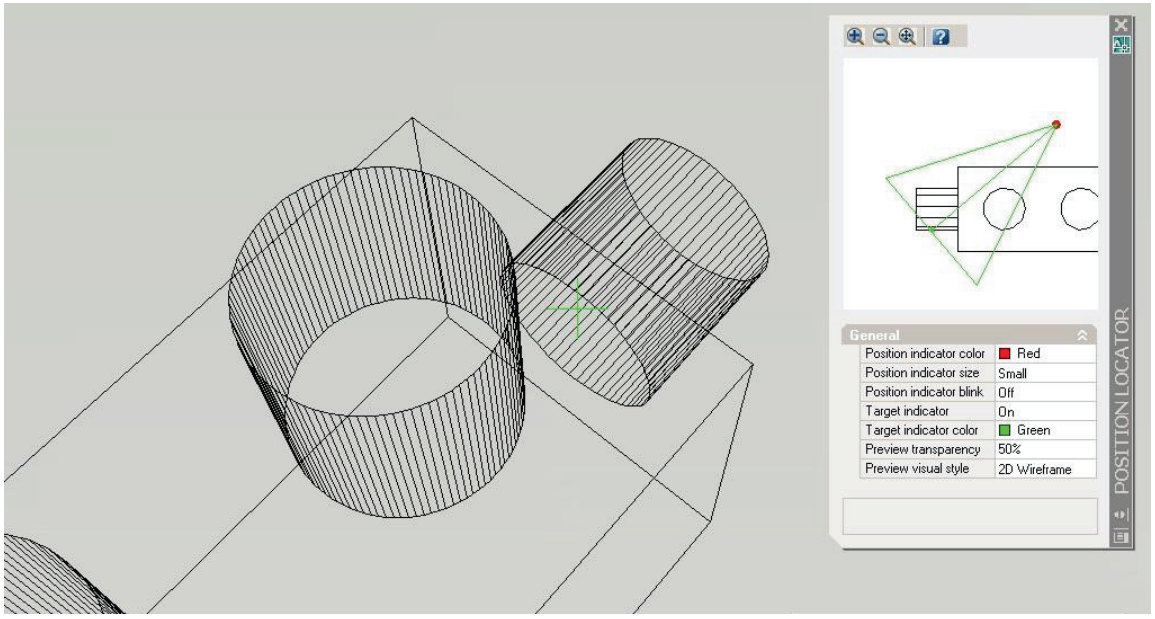
Step-3: 3DWalk or 3DFky at the command prompt. Command: **3DWALK**



Step-4: Press the **Up**, **Down**, **Left**, and **Right** keys on the keyboard to see how the camera location moves in the drawing and Position Locator dialog box.

Step-5: Move the camera and target in the Position Locator dialog box

Step-6: Click and drag your mouse to “fly” through the drawing

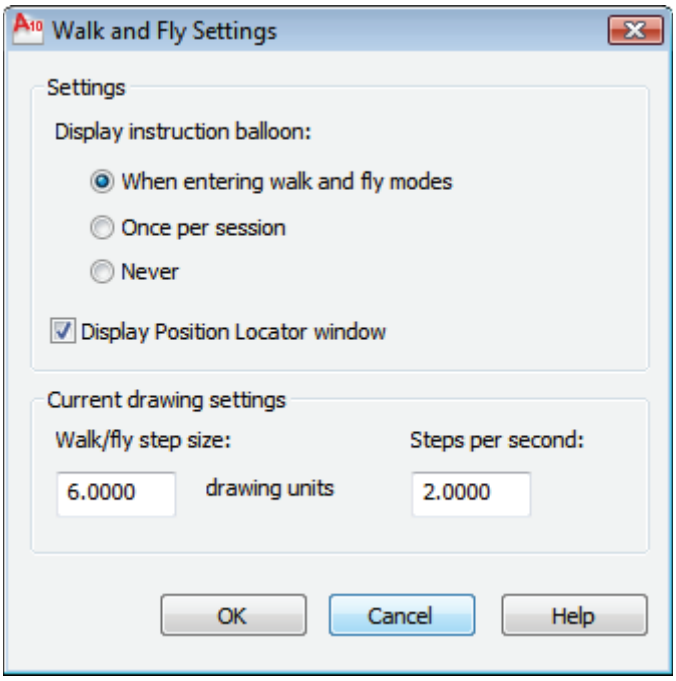


Step-7: Close the Position Locator dialog box and try walking and flying using only the keys on the keyboard and mouse

- **Walk and Fly Settings**

  Ribbon: Visualize tab ➤ Navigation panel ➤ Walk and Fly Settings. 

  Controls the walk and fly navigation settings.

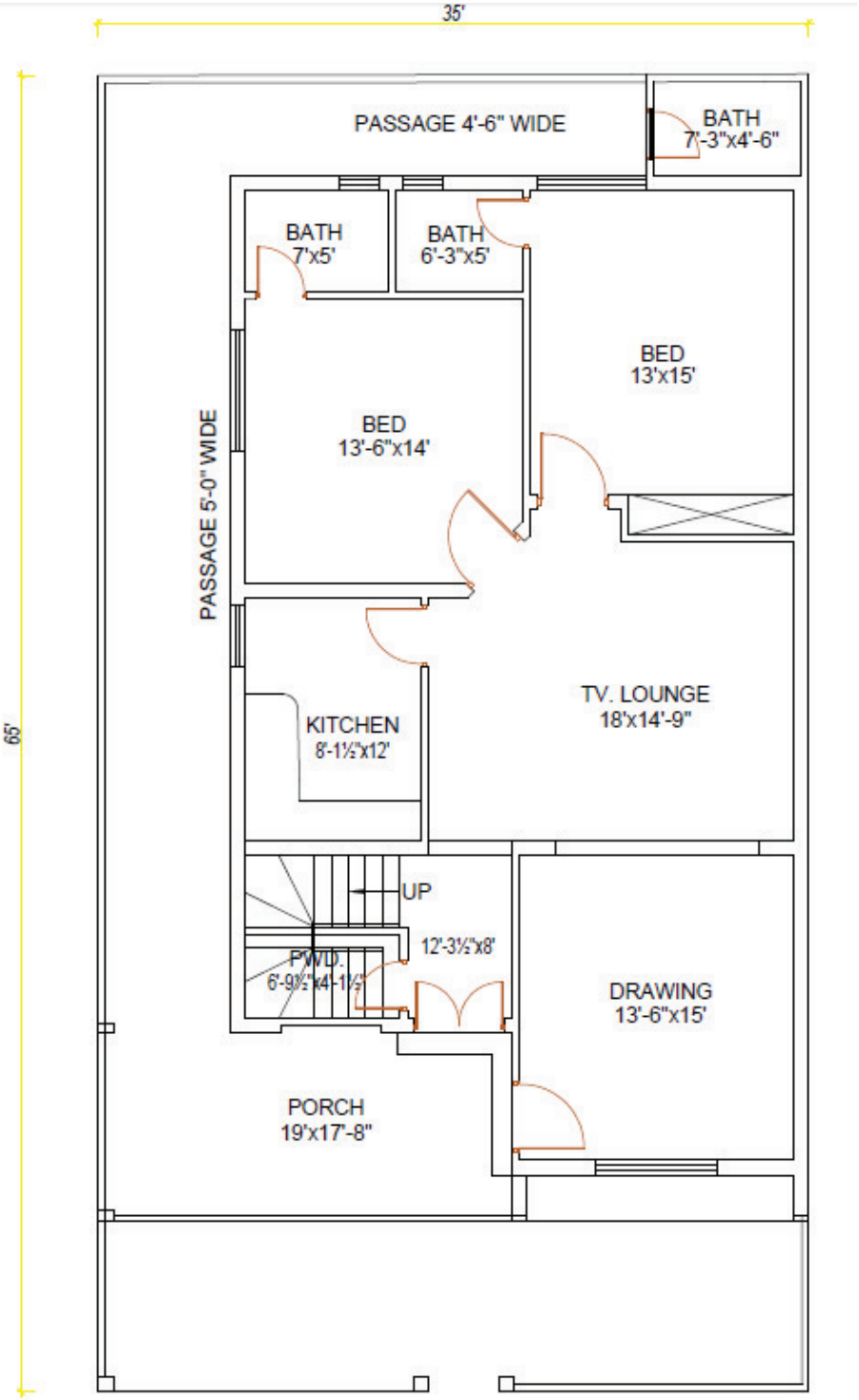


- **Settings**
  Specifies settings related to the Walk and Fly Navigation Mappings balloon and the Position Locator window.
- **When Entering Walk and Fly Modes**
  Specifies that the Walk and Fly Navigation Mappings balloon is displayed each time you enter walk or fly mode.
- **Once Per Session**
  Specifies that the Walk and Fly Navigation Mappings balloon is displayed the first time in each AutoCAD session that you enter walk or fly mode.
- **Never**
  Specifies that the Walk and Fly Navigation Mappings balloon is never displayed.
- **Display Position Locator Window**
  Specifies whether the Position Locator window opens when you enter walk mode.
- **Current Drawing Settings**
  Specifies walk and fly mode settings specific to the current drawing.
- **Walk/Fly Step Size**
  Sets the size of each step in drawing units (the STEPSIZE system variable).
- **Steps Per Second**
  Specifies how many steps occur per second (the STEPSPERSEC system variable).

PRACTICES

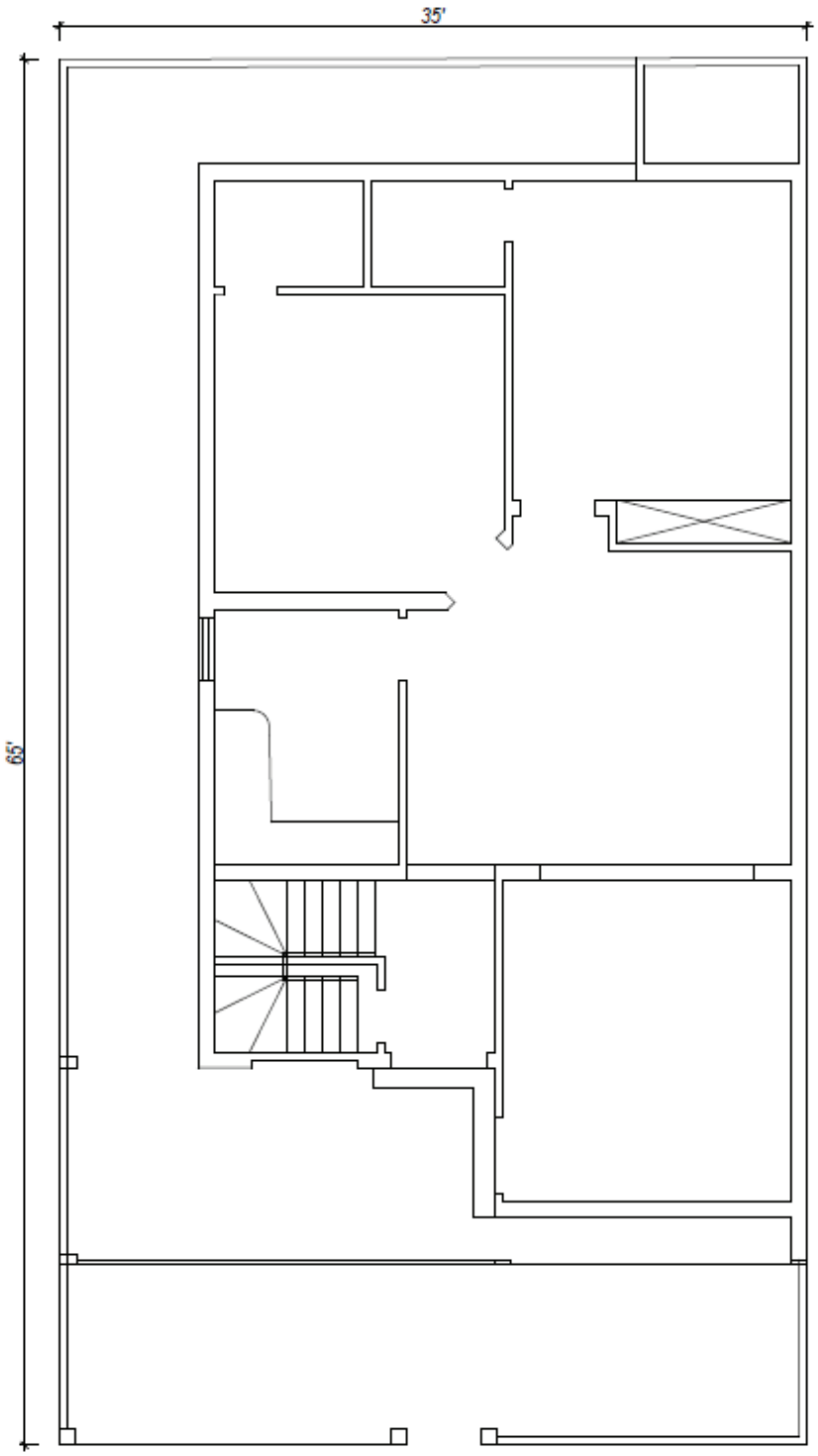
Practice-1

Develop an architectural 3D model of 35’ X 65’ plot dimension as per the following requirements
Two Rooms with attached bath, Lounge, Drawing, Kitchen, Powder Bath, Store, Servant Bath, Porch
Let the proposed drawing for above specifications/ requirement is as under:

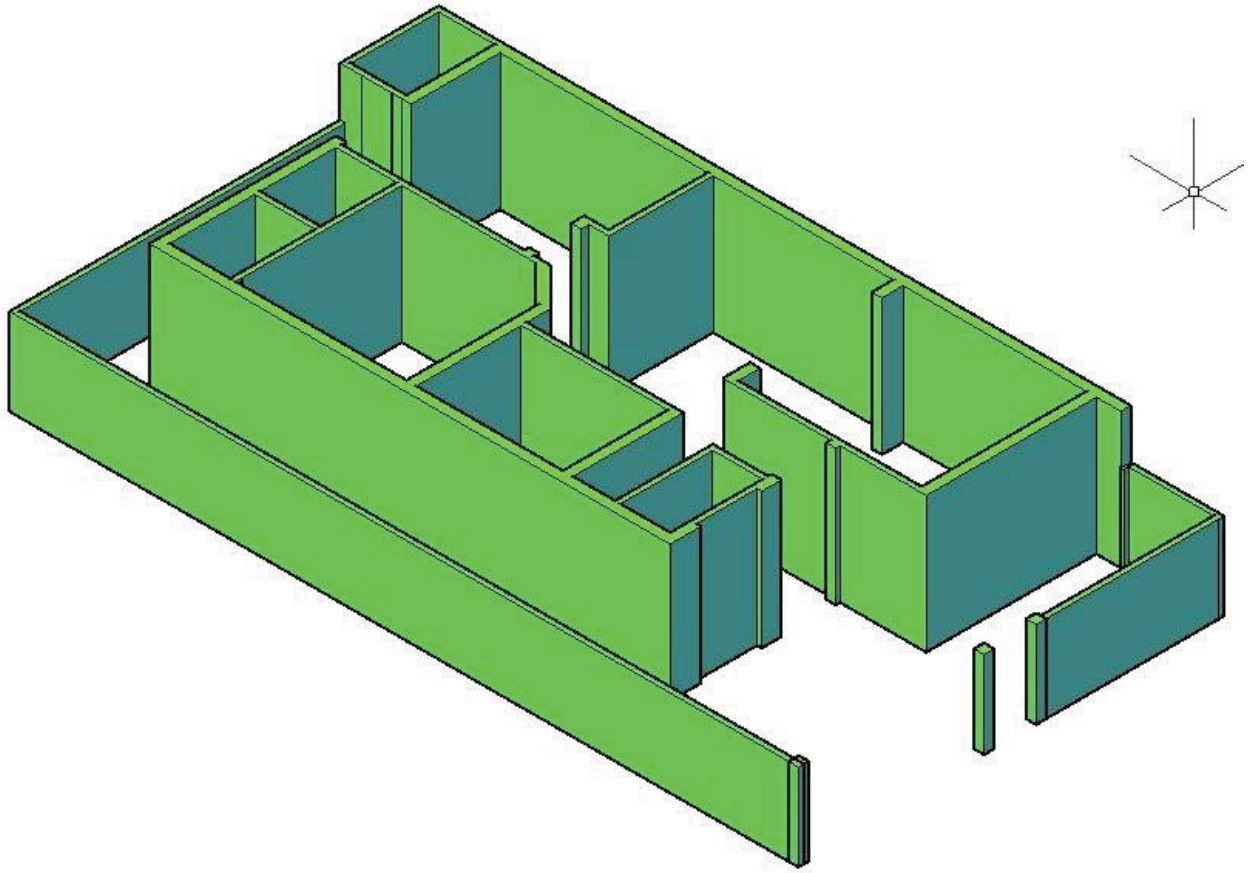


Procedure

Step 1: Draw the 2D plan of a plot whose width is 35’ and length is 65’ with the help of 2D commands as per given requirements. First of all, draw the 2D plan with the help of line command. Trim the required to have plan drawn as per given plan. Draw the lines at proper locations for positioning of doors and windows. Finish the drawing and annotate completely.



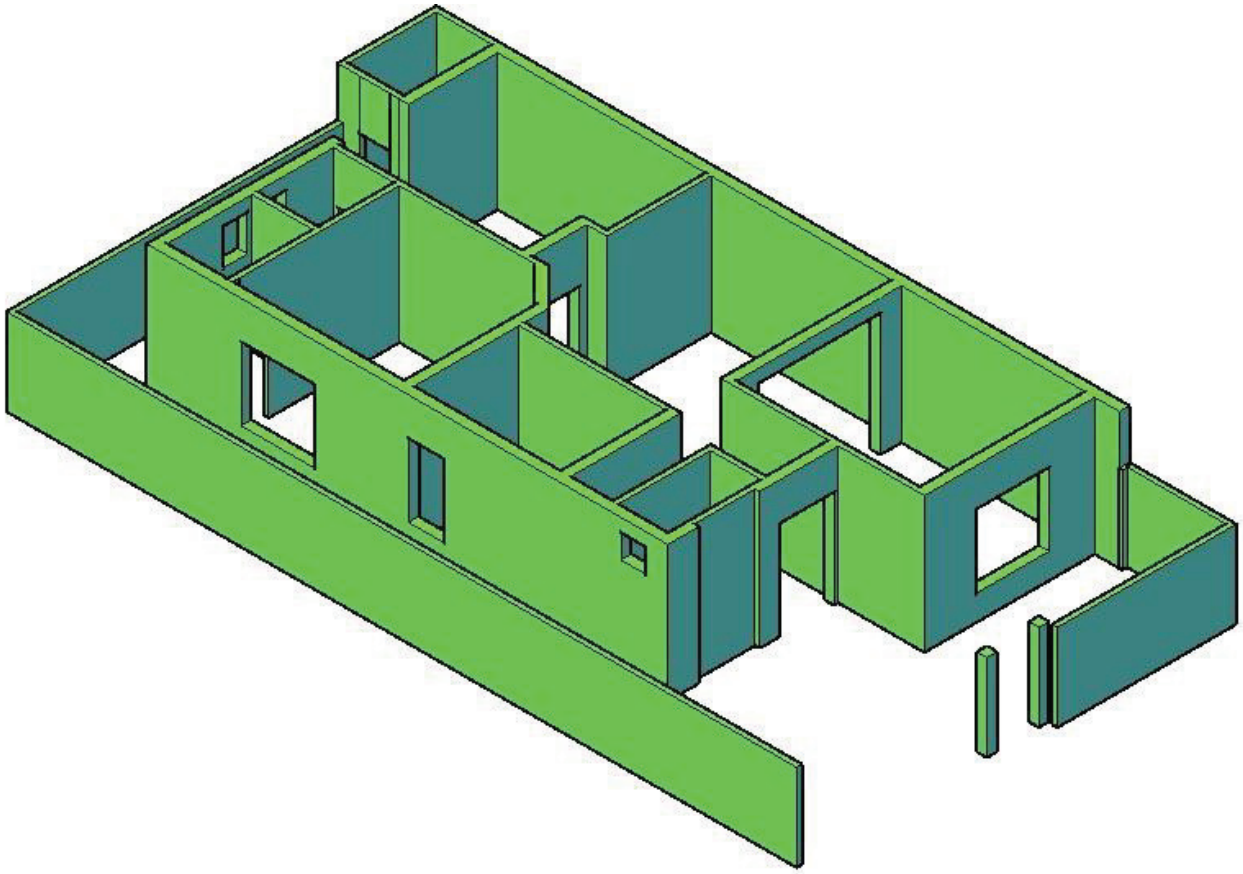
Step 2: Now create the boundary or regions to convert the 2D to 3D drawing. Create separate boundries for different heights of walls. Now use the extrude command in 3D isometric SE. Take the height of rooms walls as 11 feet and for the compound wall as 7 feet.



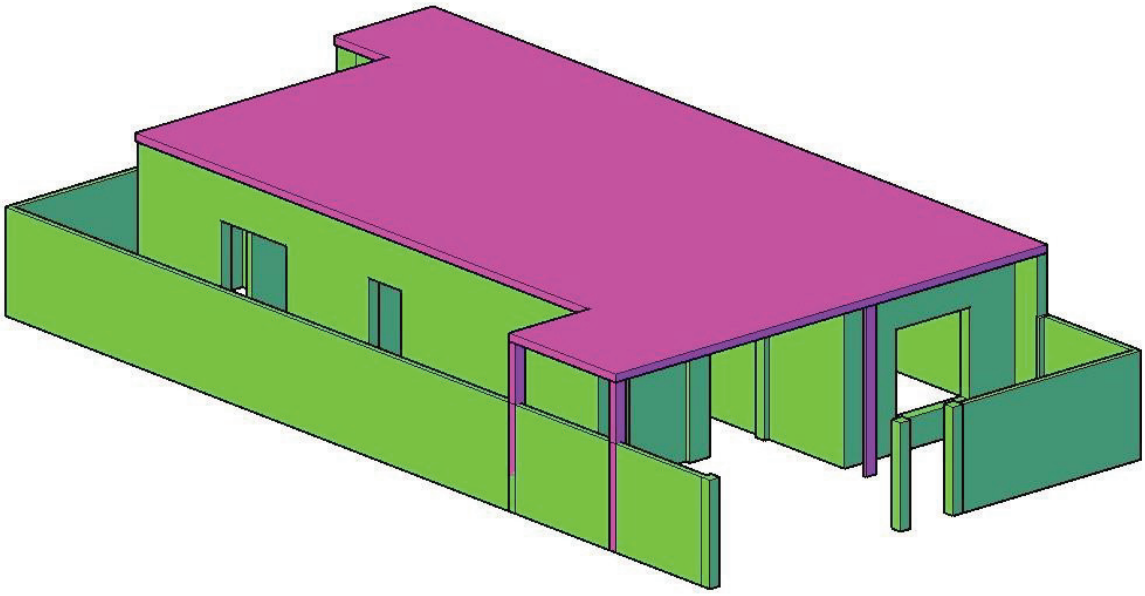
Step 3: Now create the boxes of sizes equal to the sizes of doors. Place the boxes at the locations of doors. Apply Boolean operation of subtraction “SUBTRACT” command to have opening in the wall. First select the source from which you want to have openings of doors. Then after pressing Enter key select the boxes of doors. After the execution of command, you will have the openings of doors.

Now create the boxes of sizes equal to the sizes of windows. Place the boxes at the locations of windows. Apply Boolean operation of subtraction “SUBTRACT” command to have opening in the wall. First select the source from which you want to have openings of windows. Then after pressing Enter key select the boxes of windows. After the execution of command, you will have the openings of windows.

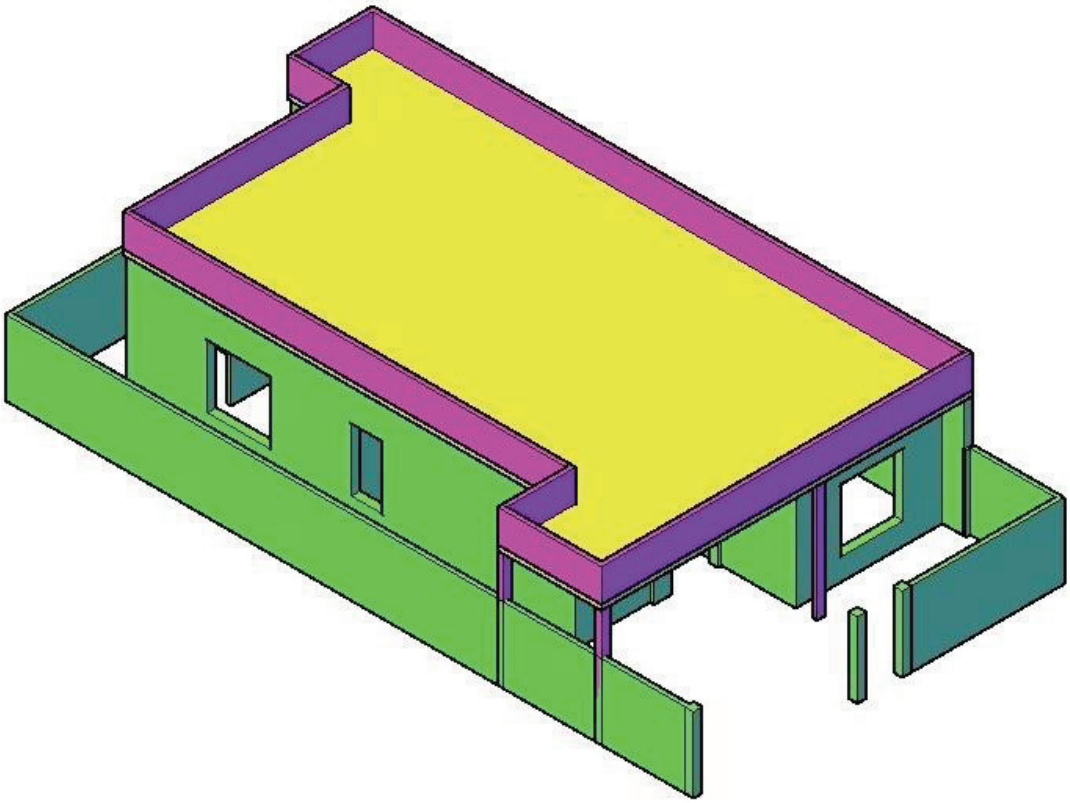
Now create the boxes of sizes equal to the sizes of ventilators. Place the boxes at the locations of ventilators. Apply Boolean operation of subtraction “SUBTRACT” command to have opening in the wall. First select the source from which you want to have openings of ventilators. Then after pressing Enter key select the boxes of ventilators. After the execution of command, you will have the openings of ventilators.



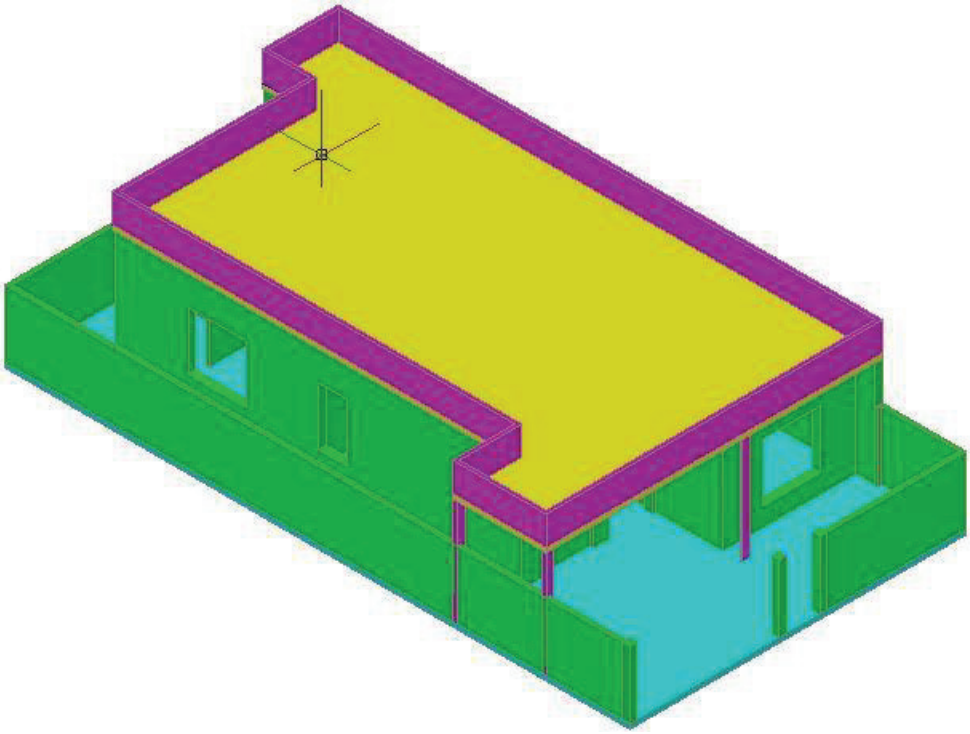
Step 4: Make the roof of this site plan by using extrude commands.



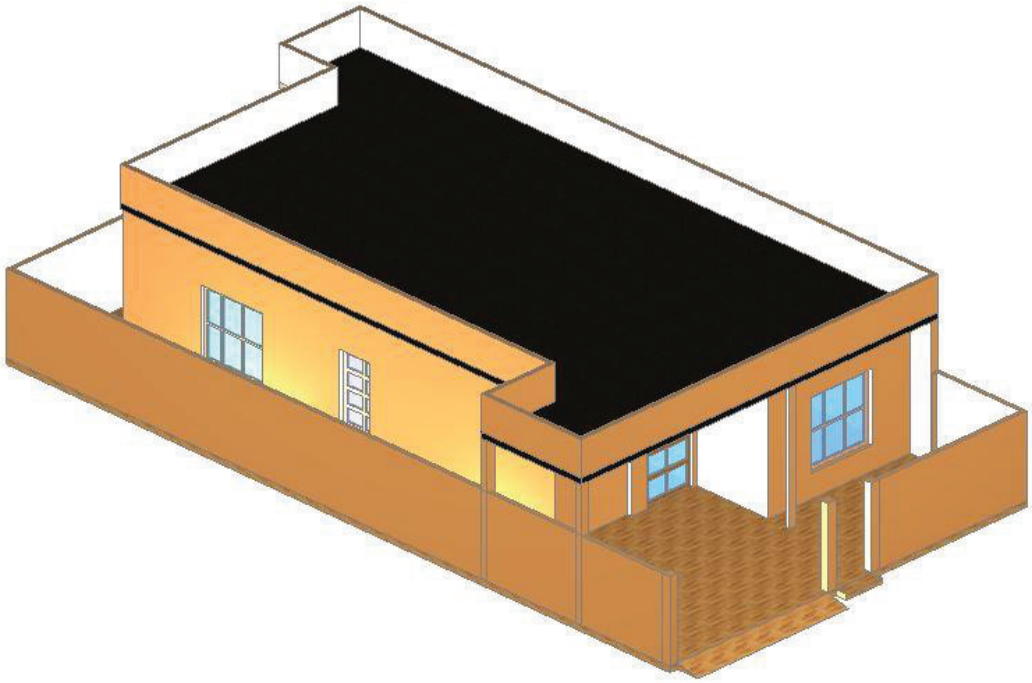
Step 5: Design the parapet wall by using extrudes and subtracts commands.



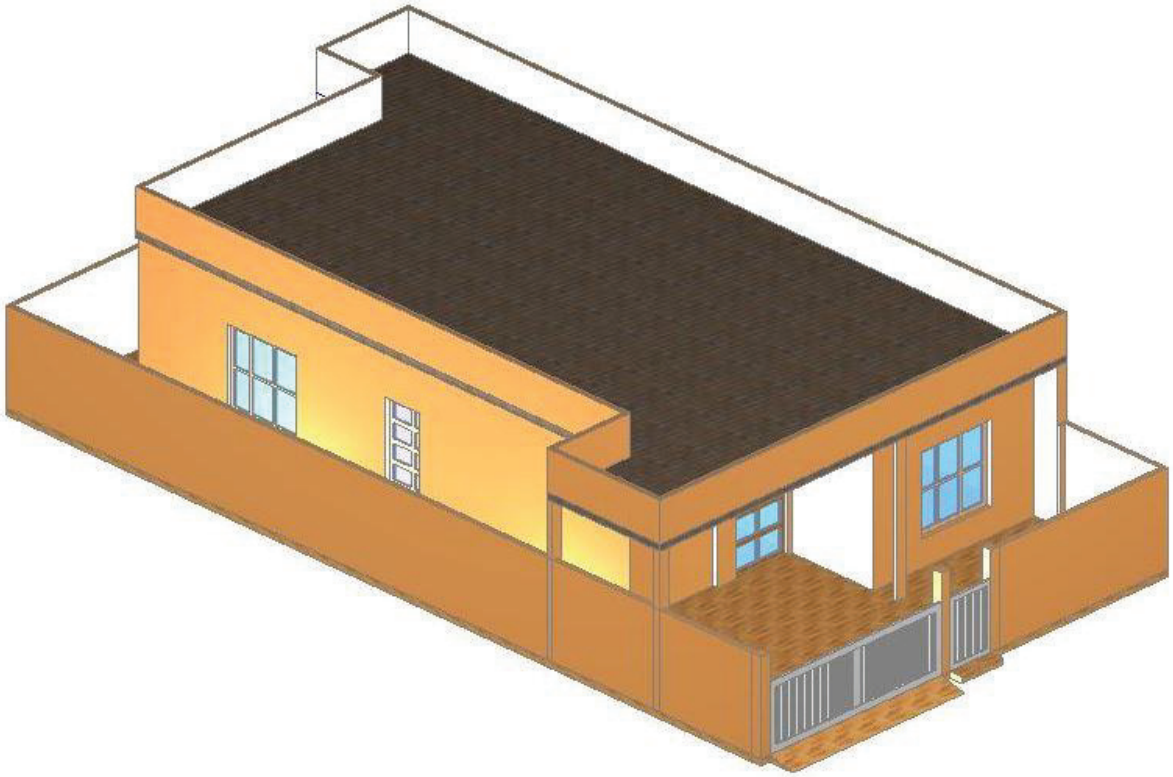
Step 6: Make the floor with the help of rectangle and extrude commands.



Step 7: Draw 3D doors, windows and ventilator by use of 2D commands and Pullpush/ extrude command. Fix the same by use of 3D move command.



Step 8: Draw 3D Main gate by use of 2D commands and Pullpush/ extrude command. Fix the same by use of 3D move command.



Practice-2

Make 3D Fan with 3 blades with dimension 12 Inches in diameter.

Step 1: Make the 2d plan of fan whose size is 12” diameter having three blades with help of 2d commands.

Step 2: Convert this 2d sketch into 3d model of fan by using extrude command.

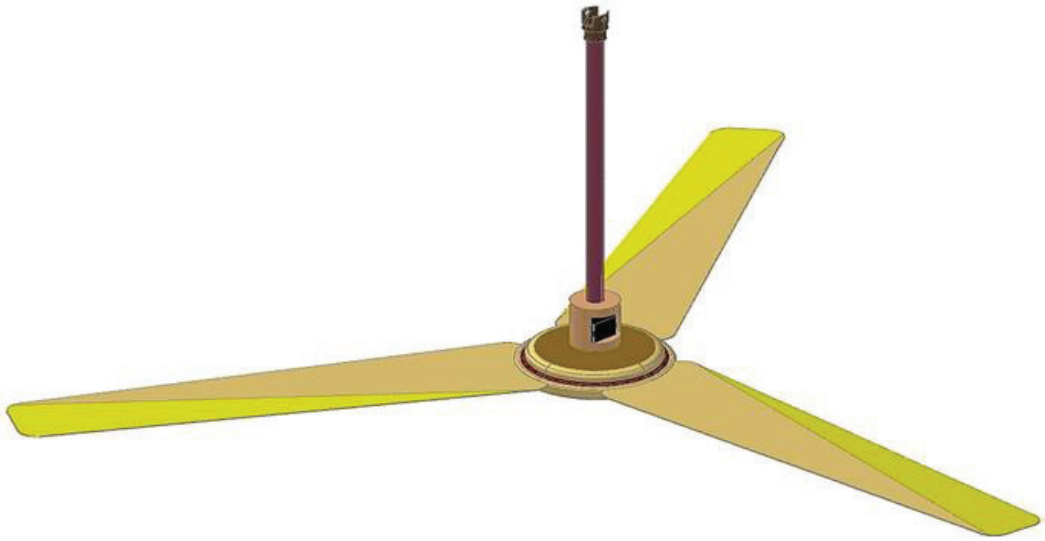
Step 3: Ake the rod of fan with the help of cylinder command

step 4: Make the cup of the fan by using cone command

Step 5: Make the round corner of the circle with the help of 3d fillet command

Step 6: Make the blades of the fan by using mesh surface command

Step 7: To join the motor rod and blades by using union command



Learning Unit 3:
Render 3D Model

In this learning unit you will learn how to have material and light control and how-to 3D navigate control

After completion of this learning unit you will be able to understand following.

- Apply material to required 3D Model as per given specification
- Apply lights to get the requisite scene of required 3D model
- Assign cameras to execute different views of required 3D Model.
- Render and print the 3D model according to required size & orientation

3. Apply Material to Required 3D model as per Specifications: -

Applying the materials is a relatively easy process, getting them to look exactly the same you want these. Once the materials are added, the lights and shadows look realistic.

3.1. Material and light control.

(Planner mapping, Texture map, Opacity control, Render context, Render sampling, etc.)

3.1.1. Introduction to Render

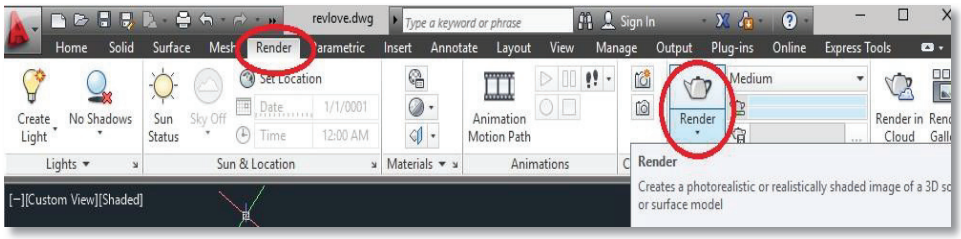
Rendering can be a very time-consuming aspect of a project. Because of the subtleties involved, you can spend a lot of time adjusting camera positions, lighting, and materials. In the past, you might spend more time creating a rendering than you spent actually building the 3D model. In addition, when you work with multiple light sources, each of which casts shadows, the computer calculations require a considerable amount of horsepower. Again, the good news is that the new tools in AutoCAD can help shorten this process, because you can now preview many aspects of your final image before actually creating a rendering. And as in previous versions, you can do initial renderings at lower quality settings or render just a portion of the final image, to test your changes before creating a final high-resolution rendering.

The process of creating a computerized rendering involves four steps:

- **Create the actual model**
- **Place lights**
- **Attach materials to objects in the model**
- **Render the image**

Other than creating the model, these procedures are conceptual rather than discrete sequential steps, and often are performed in an iterative process. For example, you may place some lights and create a test rendering. Then, after viewing the results of your test, you may change some of the lights and render the image again.

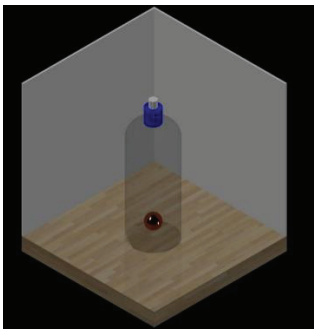
3.1.2. Render Tab



Remember

If the Render Option is not displayed on the Visualize tab, right-click the Visualize tab and click Panels →Render.

Render is used to get the most realistic and photorealistic view of your 3D drawing by adding realistic materials.



3.1.3. Texture Map

Texture maps are useful for creating many kinds of materials, such as wood grains and wall surfaces.

You can use the following file types to create texture maps:

- **BMP, RLE, or DIB**
- **GIF**
- **JFIF, JPG, or JPEG**
- **PCX**
- **PNG**
- **TGA**
- **TIFF**

To display he Texture Map Property Settings specific to Texture map, click the Click for Texture Map Settings button

Procedure

Command entry: materials

Controls the property settings for Texture Map.

- **Click for Texture Map Settings**
  Displays a window with property settings to adjust the appearance of the texture. This button appears once an image is selected for the Texture Map.

- **Collapse/Expand Display Panel**
  Collapses (up arrows) and expands (down arrows) the display panel.

- **Texture Map Slider**
  Controls the blending of the texture map with the assigned control properties for the material.

- **Scaling & Tiling**
  Provides settings to adjust the scaling and tiling for the map.

- **Offset & Preview**
  Provides settings to adjust the material offset and preview for the map.

3.1.4. Adding Material to a Drawing

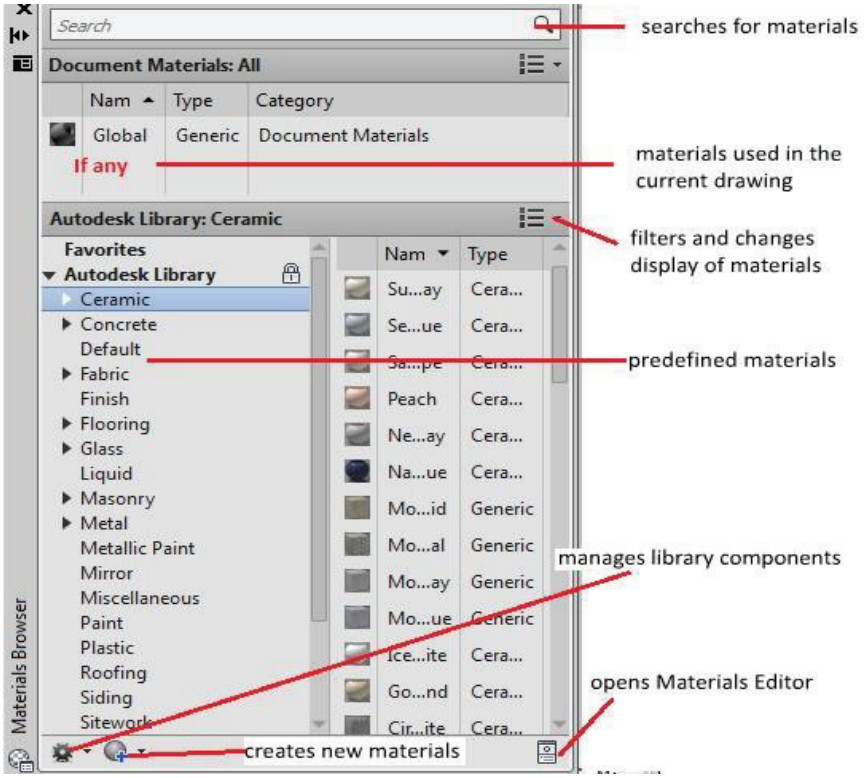
A material is simply an image stretched over an object to make it appear as if the object is made out of various materials such as wood, marble, brick, metal, plastic, glass, and so on.

- **To Browse Material**

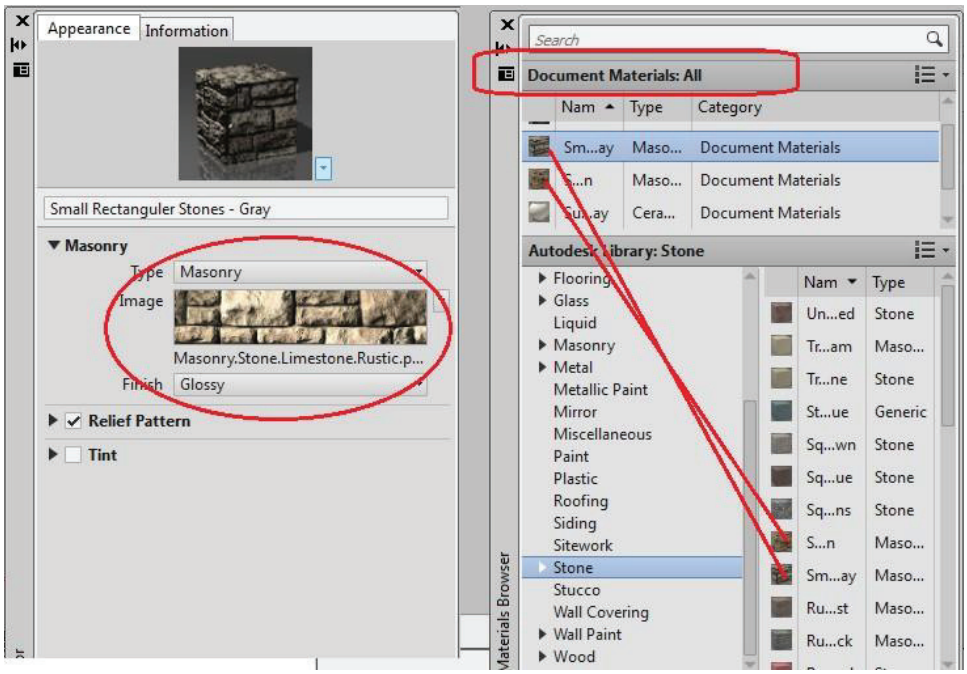
Render Tab	Button	Command Entry
Material → Browse Material.		MARBROWSEROPEN

Step -1

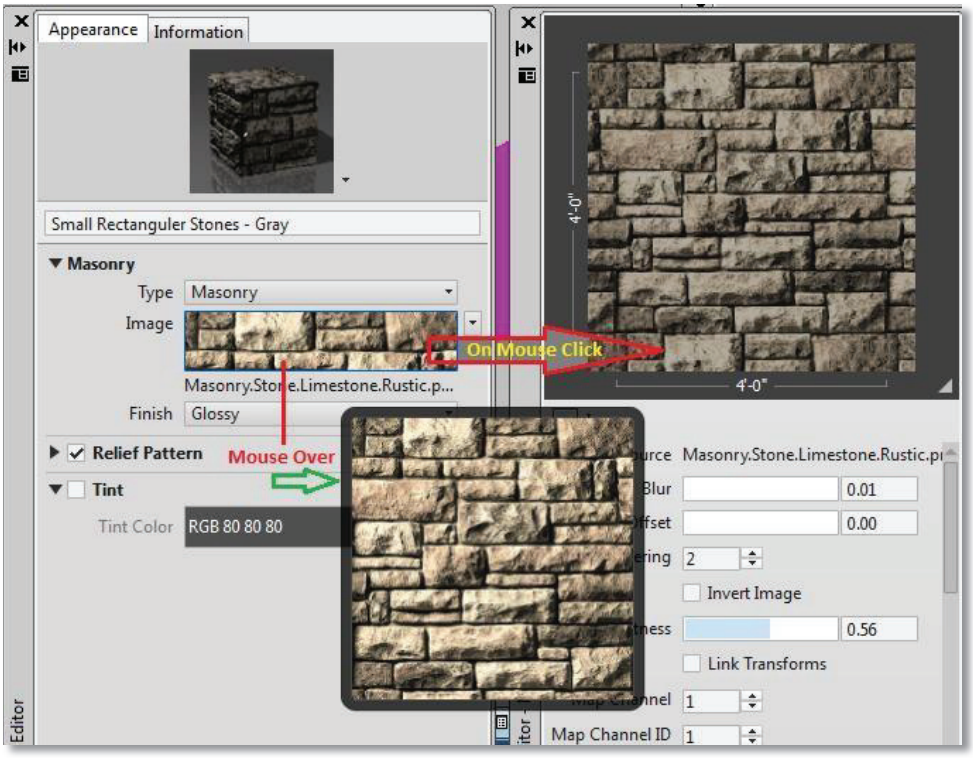
View→Render→Materials Brower



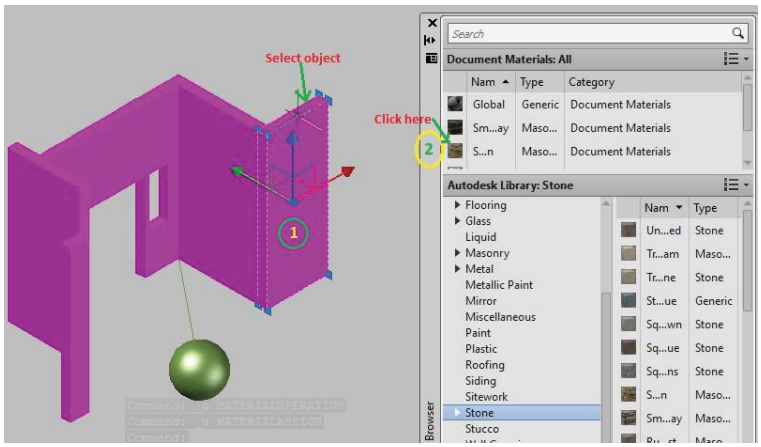
Step-2: Double Click or drag any of the material from material library into the document material list as shown in the figure below



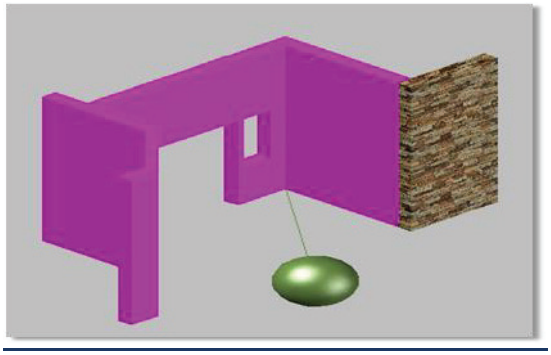
Step-3: Go to the Material list and apply material as shown in the figure



i. You will get the following.
ii. Blank space showing the following



Step 4: Type **render** command in command bar to view the render with applied material. Past picture here



Visual Styles Control must be in realistic view

3.1.5. Materials

Material contains settings that affect how materials are handled by the renderer.

- **Apply Materials**
  Apply the surface materials that you define and attach to an object in the drawing. If Apply Materials is not selected, all objects in the drawing assume the color, ambient, diffuse, reflection, roughness, transparency, refraction, and bump map attribute values defined for the GLOBAL material.

i. Texture Filtering / Texture Mapping

Specify how texture maps are filtered./

ii. Force 2-Sided

Control if both sides of faces are rendered.

3.1.6. Control Sampling

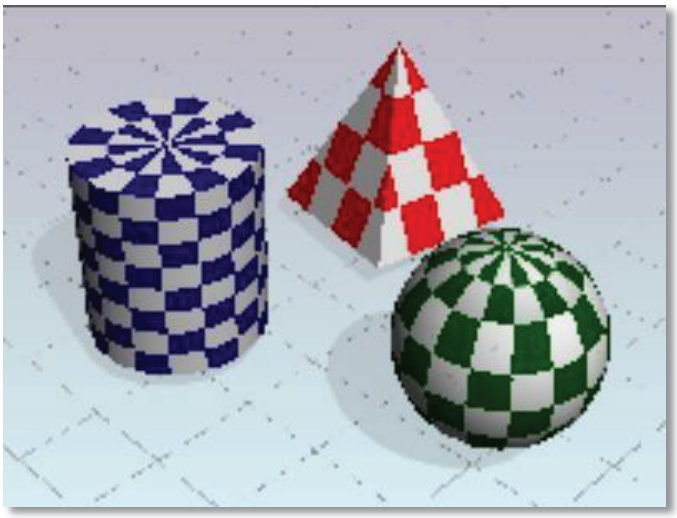
Control how the renderer performs sampling.

Sampling provides a "best guess" color for each rendered pixel. The renderer first sample the scene color at locations within the pixel or along the pixel's edge, then uses a filter to combine the samples into a single pixel color. Increasing the minimum and maximum sample ranges greatly improves the quality of a rendering.

If image quality is highly degraded

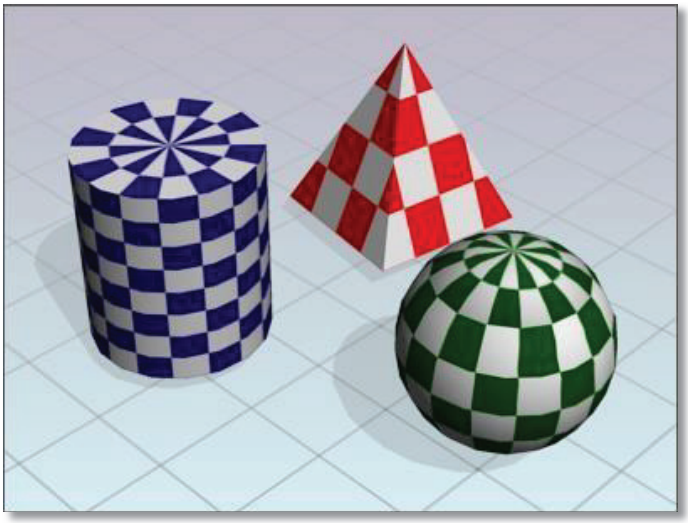
- Min. Samples = 1/64;
- Max. Samples = 1/4.

Note:
Controls sampling can be applied.



In the following example, increased sampling smooth's edges

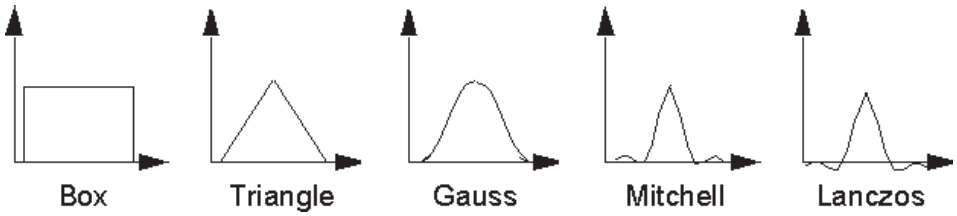
- Min. Samples = 1;
- Max. Samples = 16.



i. Filter Type

There are five filter methods:

- Box
- Gauss Triangle
- Mitchell
- Lanczos



3.2. Shadow

Contains settings that affect how shadows appear in the rendered image.

3.2.1. Mode

- **Simple**
  Generates shadow shaders in a random order.
- **Sort**
  Generates shadow shaders in order, from the object to the light.
- **Segments**
  Generates shadow shaders in order along the light ray from the volume shaders to the segments of the light ray between the object and the light.

3.2.2. Shadow Map

Control if shadow mapping is used to render shadows. When on, the renderer renders shadow-mapped shadow. When off, all shadows are ray-traced.

3.2.3. Sampling Multiplier

Globally limits shadow sampling for area lights.

3.3. Ray Tracing

Ray tracing contains settings that affect the shading of a rendered image, which effects of reflection and refraction.

i. **Max Depth**

Limit the combination of reflection and refraction.

ii. **Max Reflections**

Set the number of times a ray can be reflected.

iii. **Max Refractions**

Set the number of times a ray can be refracted

3.3.1. Illumination

Indirect illumination techniques, like global illumination and final gathering, enhance the realism of a scene by simulating radiosity, or the inter-reflection of light in a scene.

3.3.1.1. Enable

Specify if lights should cast indirect light into the scene.

3.3.1.2. Photons/Samples

Set how many photons are used to compute the intensity of the global illumination. Increasing this value makes global illumination less noisy but also more blurry. Decreasing this value makes global illumination more noisy but less blurry. The larger the Samples value, the greater the rendering time.

Determine the size of photons. When on, the spinner value set the size of photon. When off, each photon is calculated to be 1/10 of the radius of the full scene.

3.3.1.3. Radios

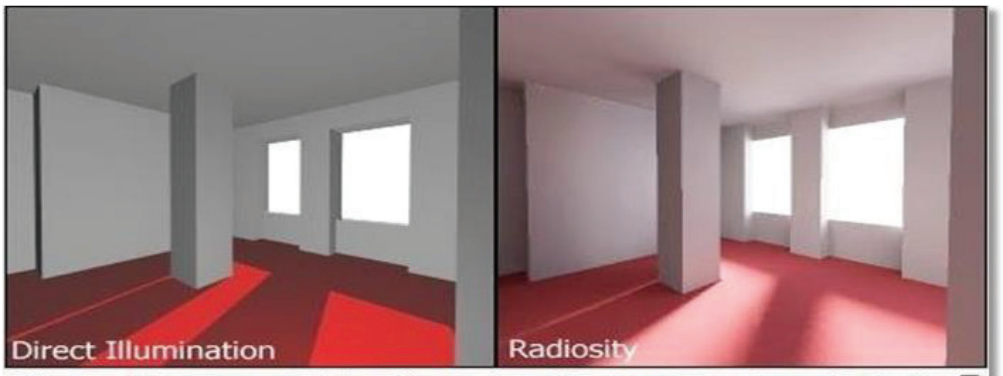
Specifies the area within which photons will be used when luminance is computed.

3.3.1.4. Max Depth

Limit the combination of reflection and refraction. Reflection and refraction of a photon stop when the total number of both equals the Max Depth setting. For example, if Max Depth equals 3 and the trace depths each equal 2, a photon can be reflected twice and refracted once, or vice versa, but it can’t be reflected and refracted four times.

3.3.1.5. Max Reflections

Set the number of times a photon can be reflected. At 0, no reflection occurs. At 1, the photon can be reflected once only. At 2, the photon can be reflected twice, and so on.



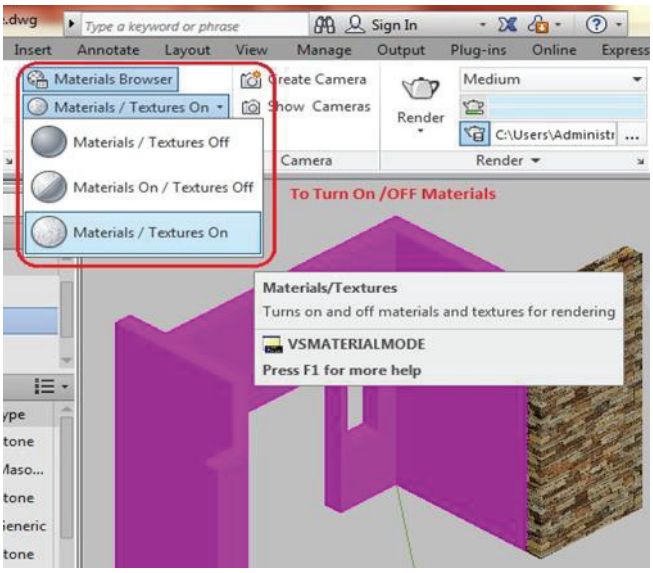
Difference between standard direct illumination without shadow umbra, and radiosity with shadow umbra

- **Diagnostic**
  Diagnostic also called visual to help you understand why the renderer is behaving in a certain way.

i. Grid: Render an image that shows the coordinate space of objects, the world, or camera.
ii. Object. Shows local coordinates (UVW). Each object has its own coordinate space.
iii. World. Shows world coordinates (XYZ). The same coordinate system applies to all objects.
iv. Camera. Shows camera coordinates, which appear as a rectangular grid super imposed on the view.

3.3.2. Material by Layers

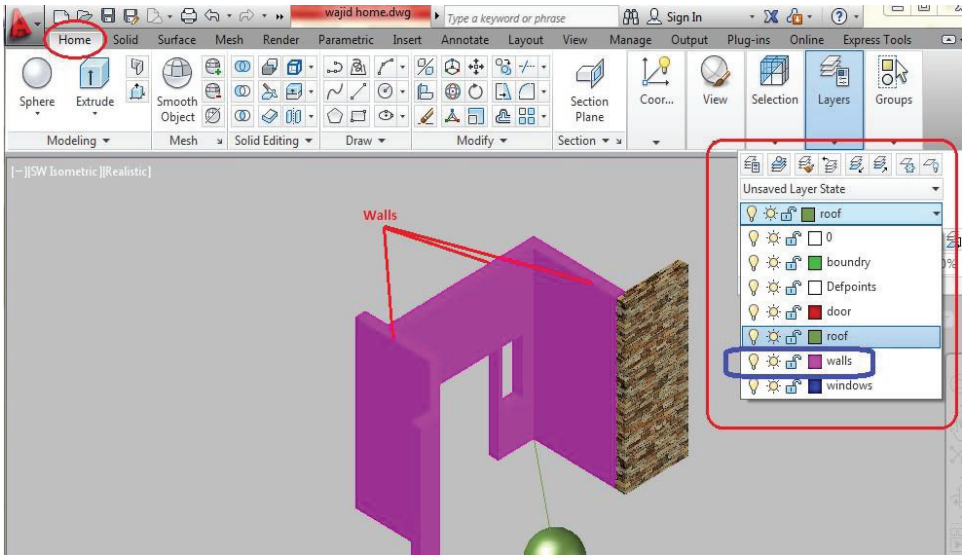
You can apply material by layer but the layer must be defined before apply **"Material by layer"**. In this example we have already defined layer for the drawing as shown in the figure below.



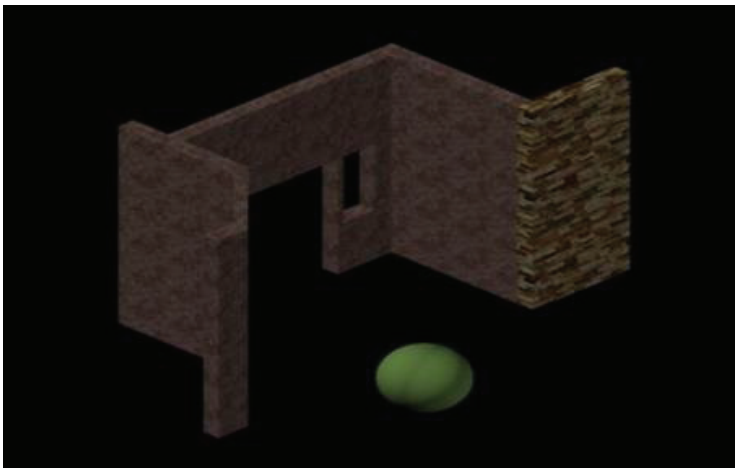
Step-1: You can attach a material to an entire layer using the Material Attach command.

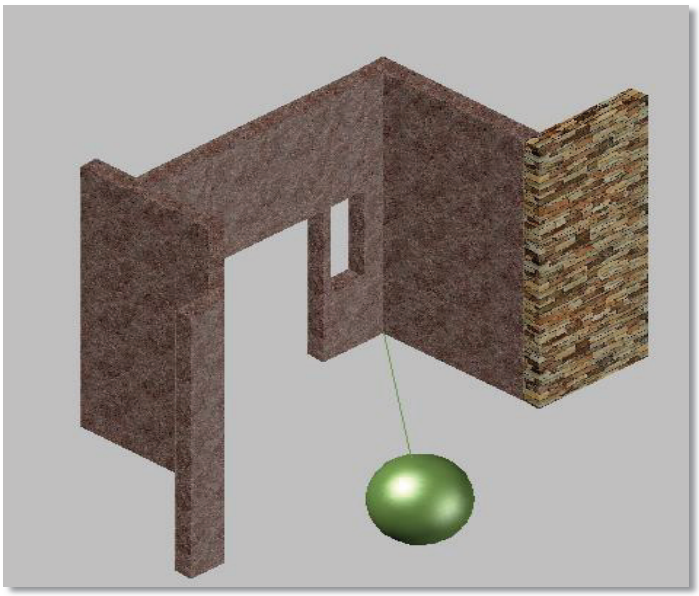
MATERIALATTACH command in command bar <Enter>

Output should be as follows



Step-2: Apply render by render command



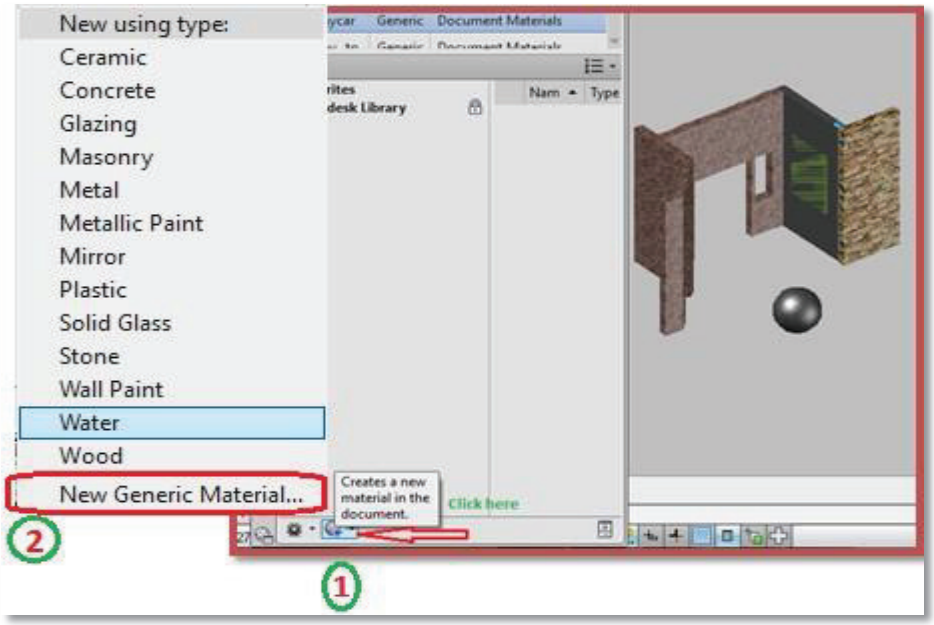


3.3.3. Create own Material

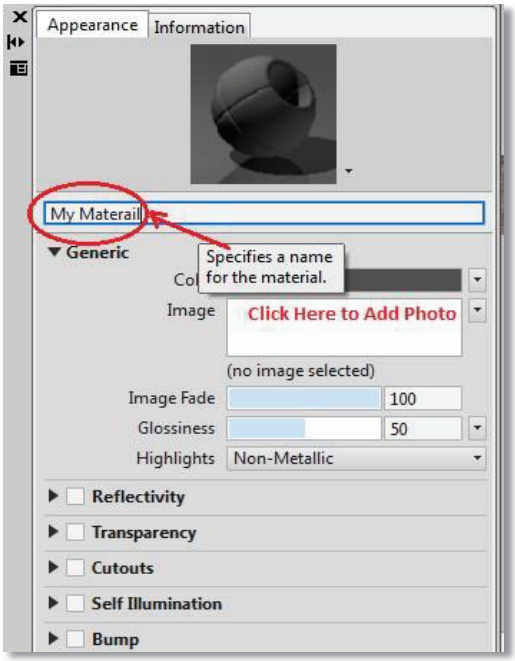
You can create your own material to apply photo and images.

Step-1: Type materials command in command bar or click Browse Material

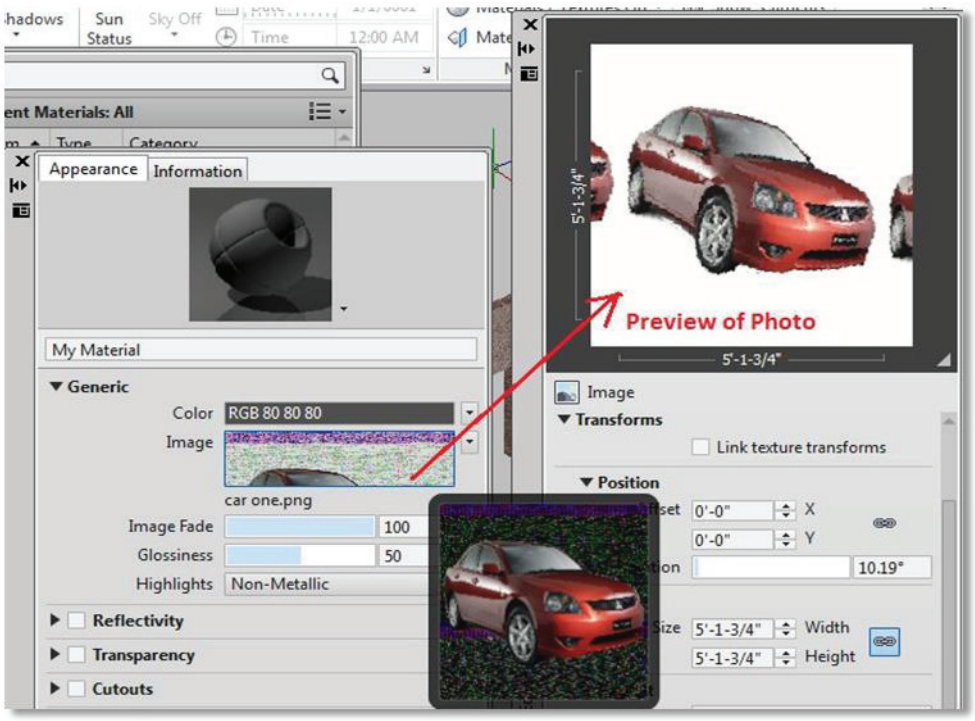
Step-2: Click Create **New Material** Option as shown in the figure below



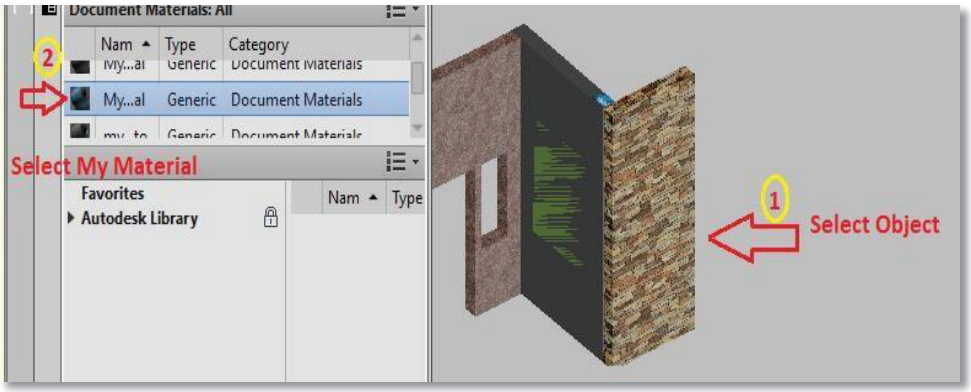
Step-3: Click a **New Generic Material** and then follow steps as described in the figure below



Step-4: Browse to file for adding any Photo as shown in the figure below.

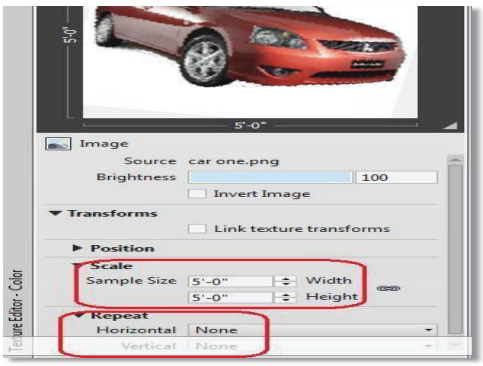


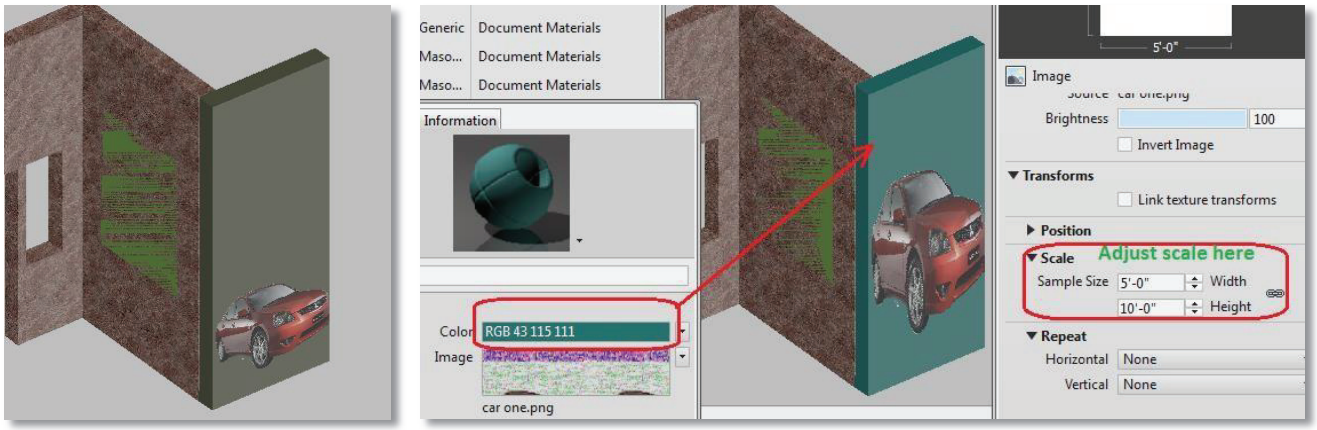
Step-5: Apply material to the selected object.



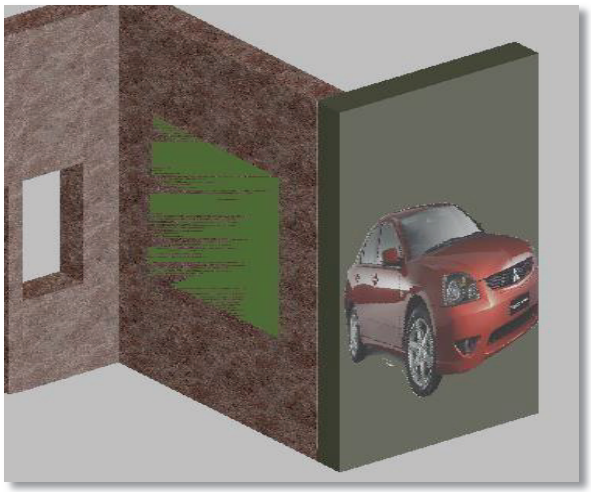
Compose the papers

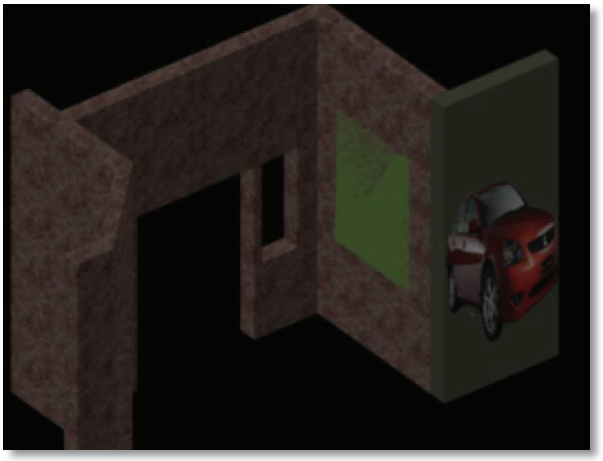
Final Out Put





Step-6: Apply render command to display render





3.4. Material Mapping

You can map material to an object by using **"MATERIALMAP"** command.

Step-1: Type **MATERIALMAP** command in command bar <Enter>

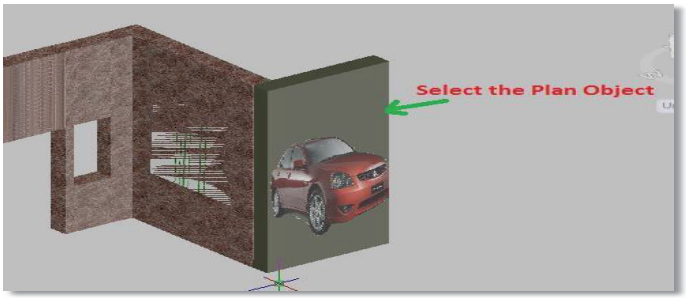
Step-2: Select an option [Box/Planar/Spherical/Cylindrical/copy mapping to/Reset mapping]<Box>: **p**

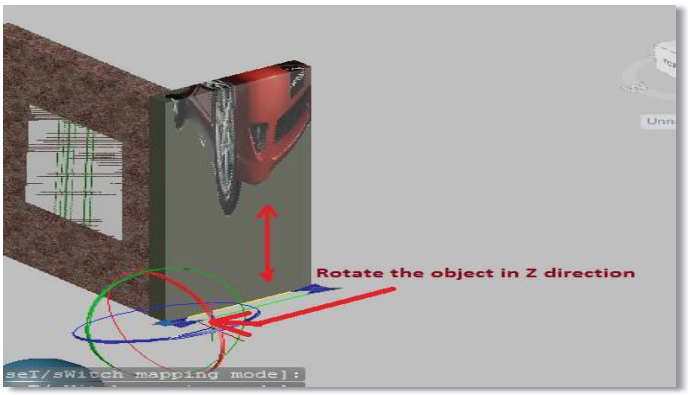
Step-3: Select faces or objects: 1 found

Step-4: Select faces or objects: <Enter>

Step-5: Accept the mapping or [Move/Rotate/reseT/sWitch mapping mode]: **R enter**

Step-6: Rotate the selected face or object by **GIZMO** to map the material applied.





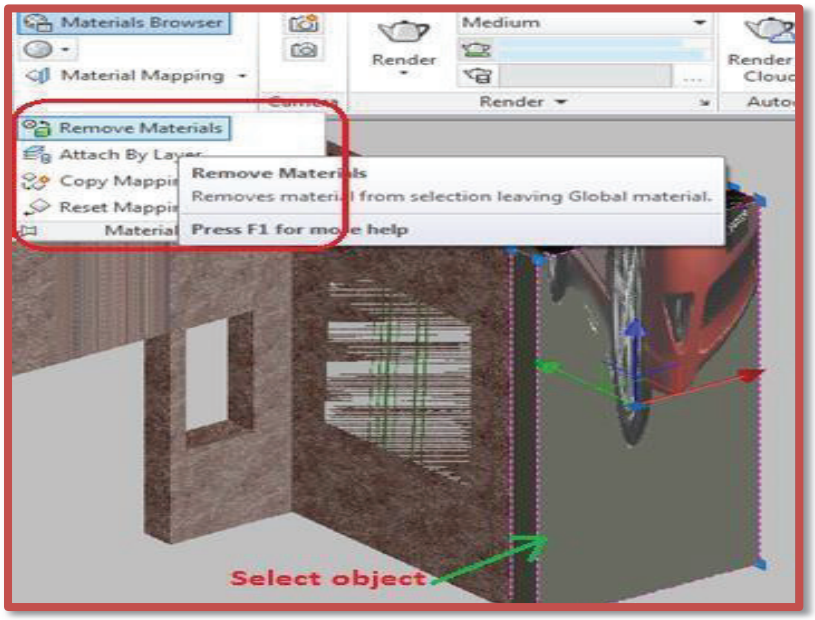
3.4.1. Remove Material

You can remove Material from an object by using the following method.

Method:

Select the object

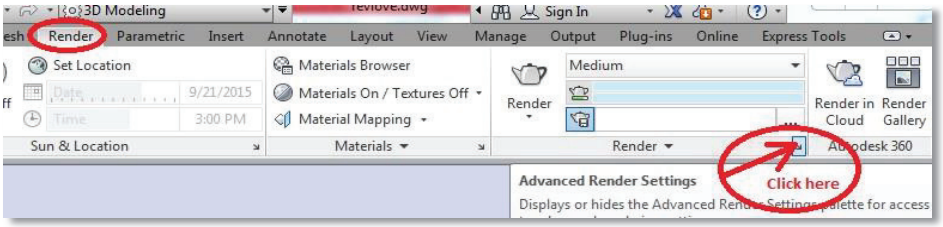
Go through 3D Modeling → Render tab → Material → Remove Material



3.4.2. Access Advance Render Settings by the following methods

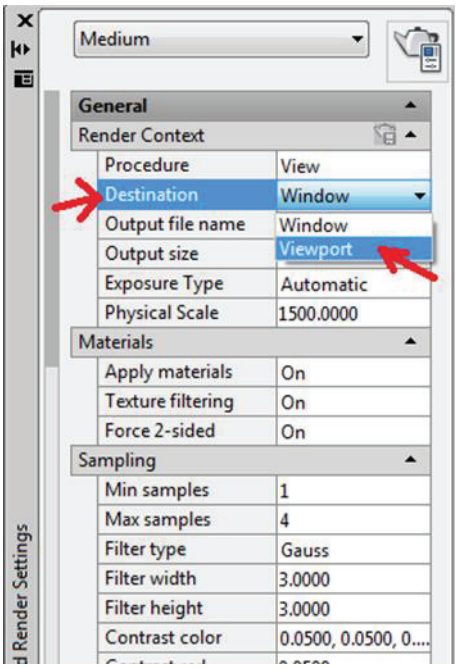
Method-1: Type RPERF in command bar.

Method-2:



3.4.2.1. Procedure Apply Advanced Render Settings

STEP BY STEP Operation on AutoCAD



GET READY. Before you begin these steps, be sure to set unit and you must have an object in your drawing to apply rendering.

Step-1: Type **RPERF** command in command bar <Enter>

Step-2: Select destination field and switch into viewport as shown below

Step-3: Type **render** command in command bar.

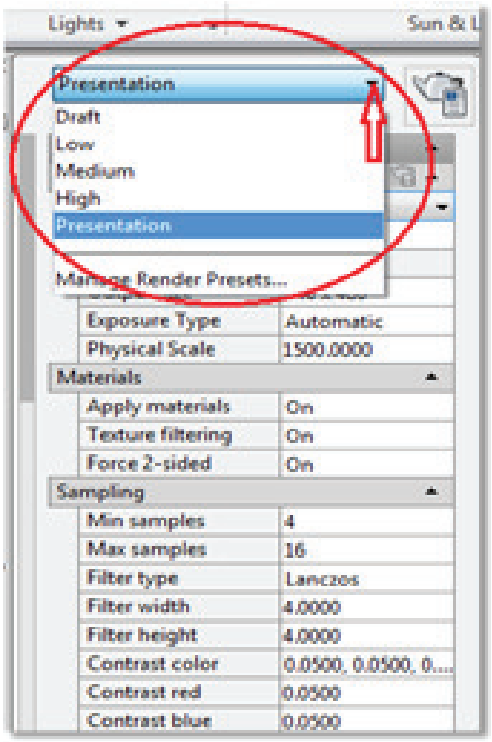
Step-4: Repeat the above steps for Window destination

3.4.2.2. Deference between window and viewport:

A separate window is open for window destination which you can save for future use while viewport destination rendered the drawing in the same window, which cannot be save and for temporary display

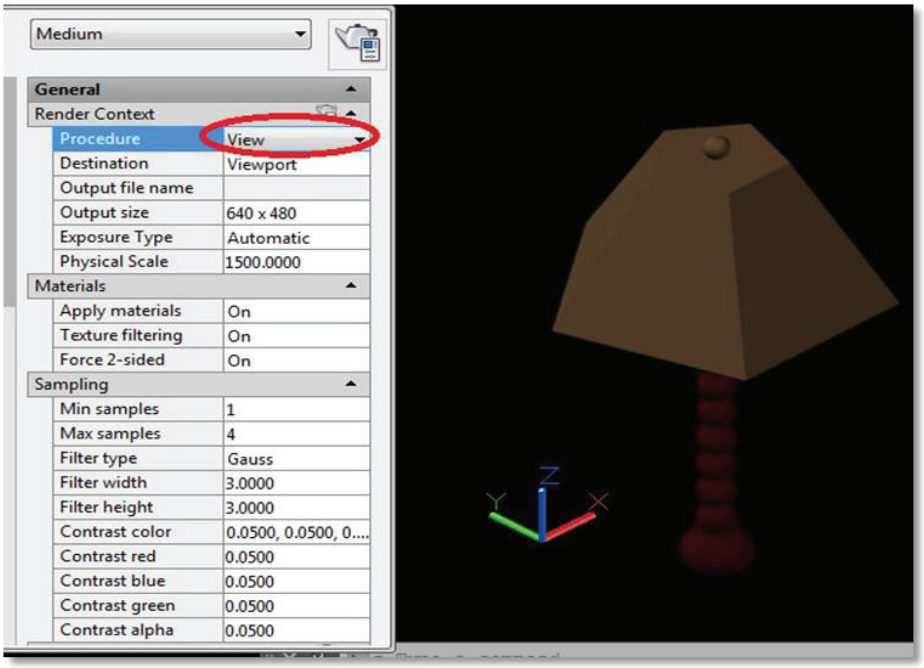
i. Quality Setting

You can set the quality of image for rendering by using Advance Render Setting as shown in figure below



Note: Quality of the rendering to be open takes time according to material, lighting etc.

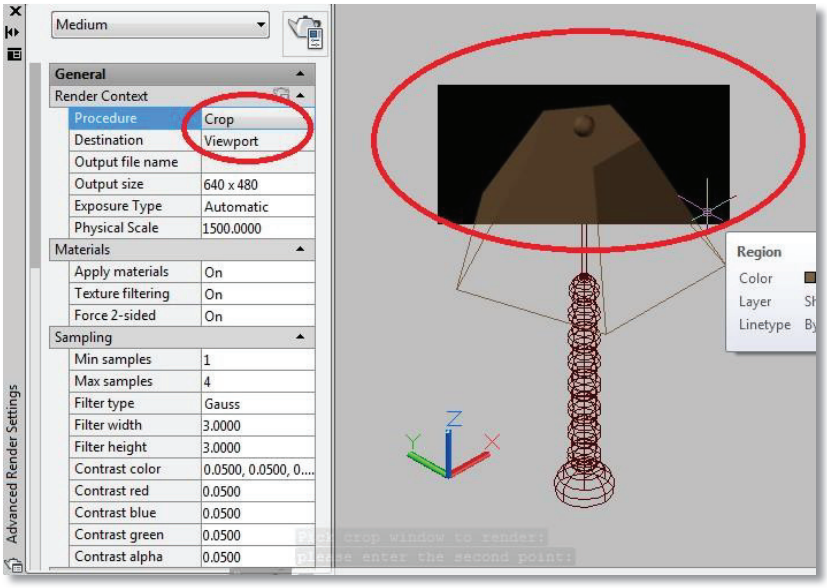
ii. Crop Procedure



Step-1: Type **RPERF** command in command bar <Enter>

Step-2: Select Procedure field and switch into crop as shown below

Step-3: Apply render by using **render** command

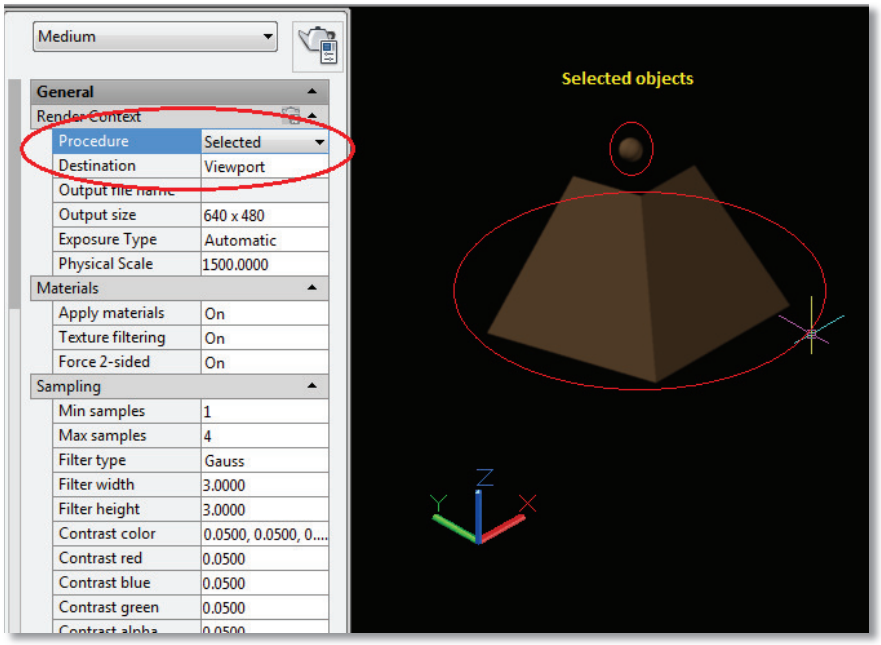


iii. Selected Procedure

Step-1: Type **RPERF** command in command bar <Enter>.

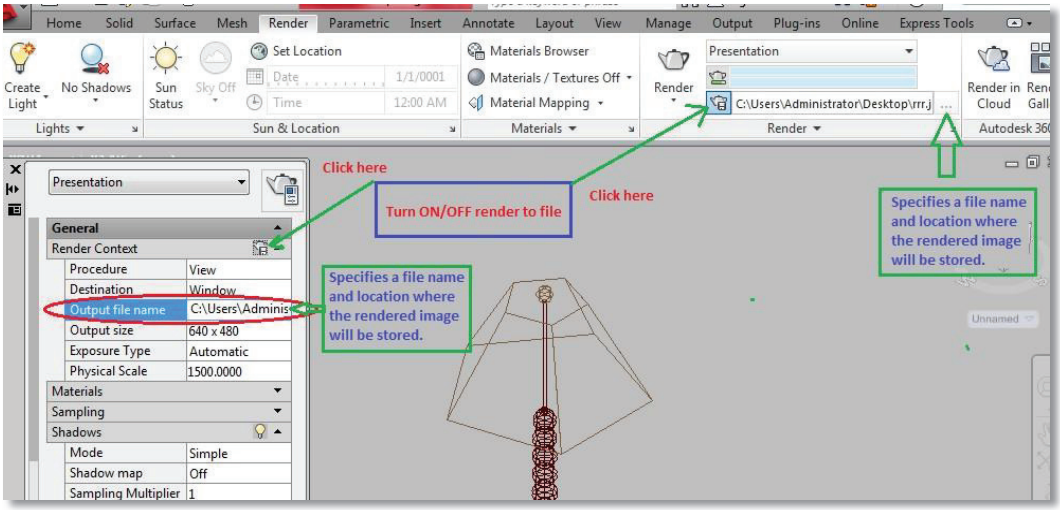
Step-2: Select Procedure field and switch into Selected as shown below.

Step-3: Apply render by using **render** command.



iv. Render to File and Turn off Render to File.

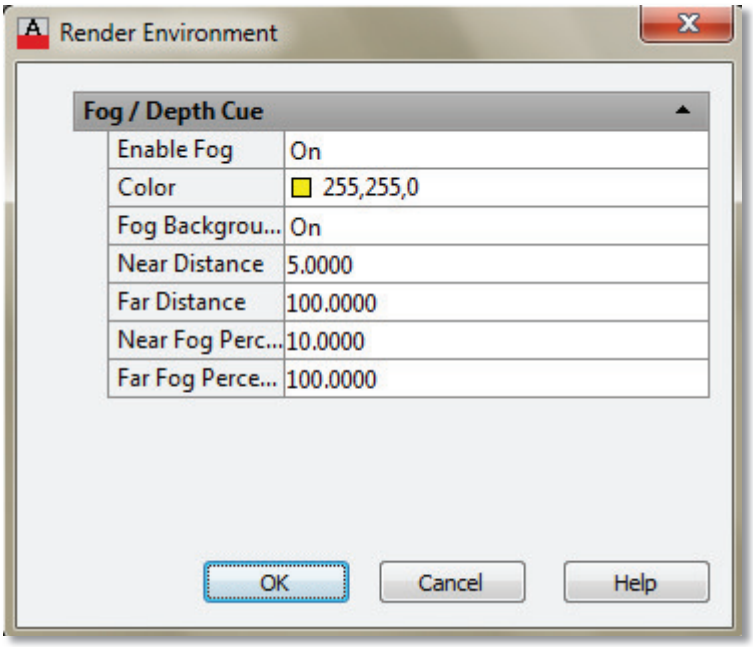
You can turn **on/off Render** to file by the following procedure.



3.4.3. RENDERENVIRONMENT

Create **fog** effect to enhance sense of distance.

Step-1: Type **RENDERENVIRONMENT** command in command bar <Enter>



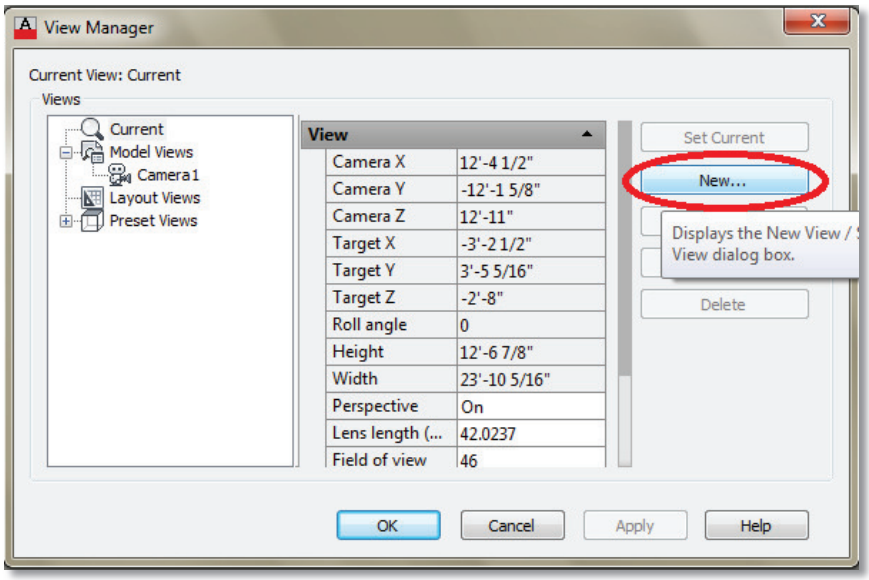
Step-2: Apply render

- **Creating Views and Applying Background**

  View is used to create, set, rename, modify, and delete named view, including model named views and camera views, layout views, and preset view.

  Here we are using view command or view manager to set different background.

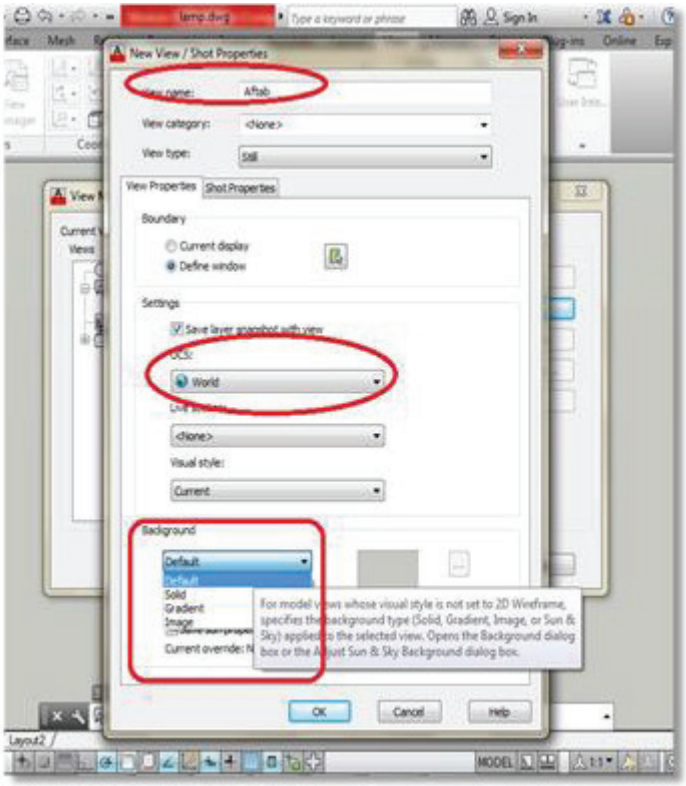
  Step-1: Type **view** command in command bar or click View tab →views Manager to get the following.



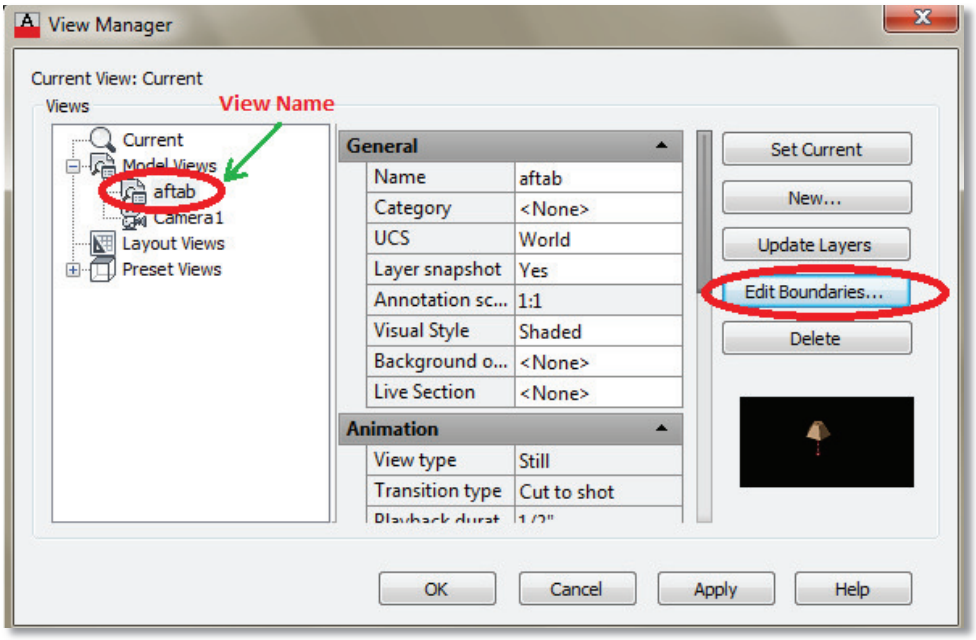
Step-2: Click the new button and get the following properties setting as shown in the figure below.

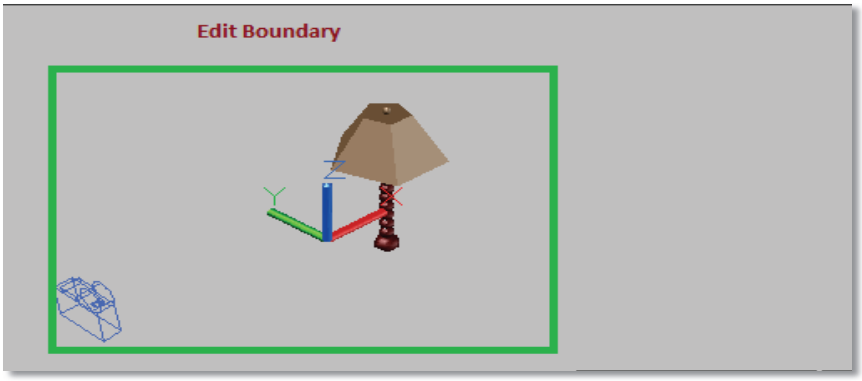
Note:
You can change the setting according to your View.

Here we applied:
View Name: Aftab
UCS: World

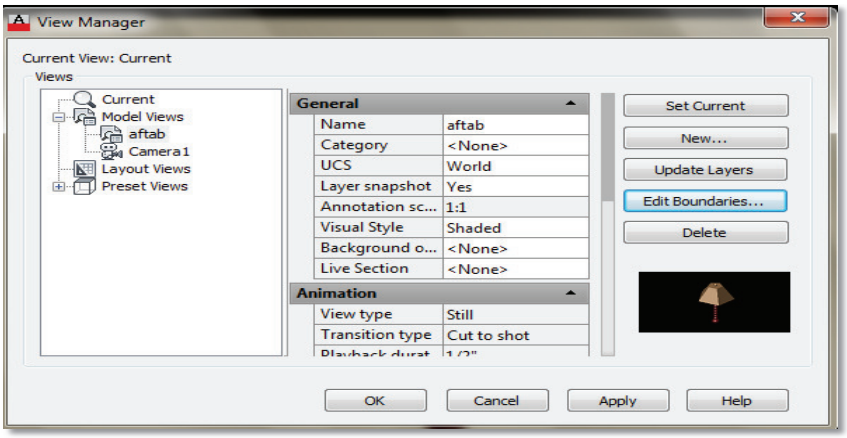


Step-3: Click the Edit Boundary option to define your own boundary for the background as shown in the figure below.

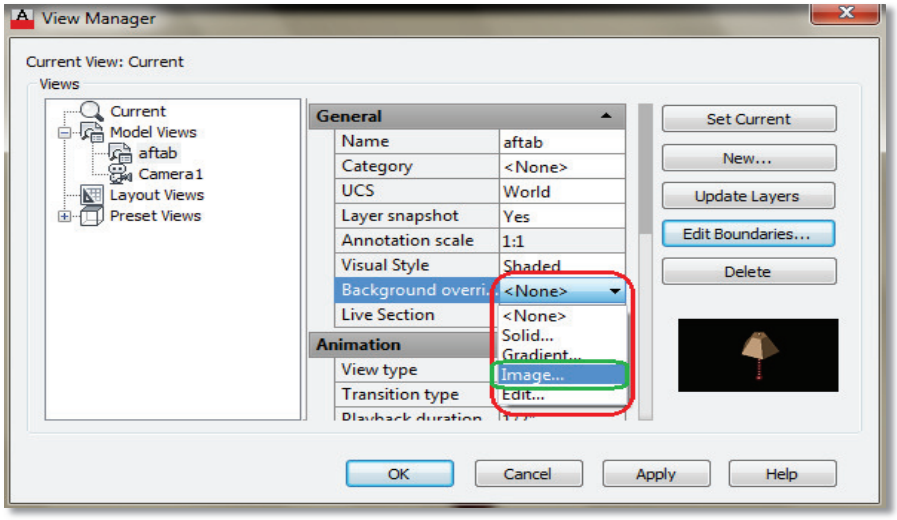




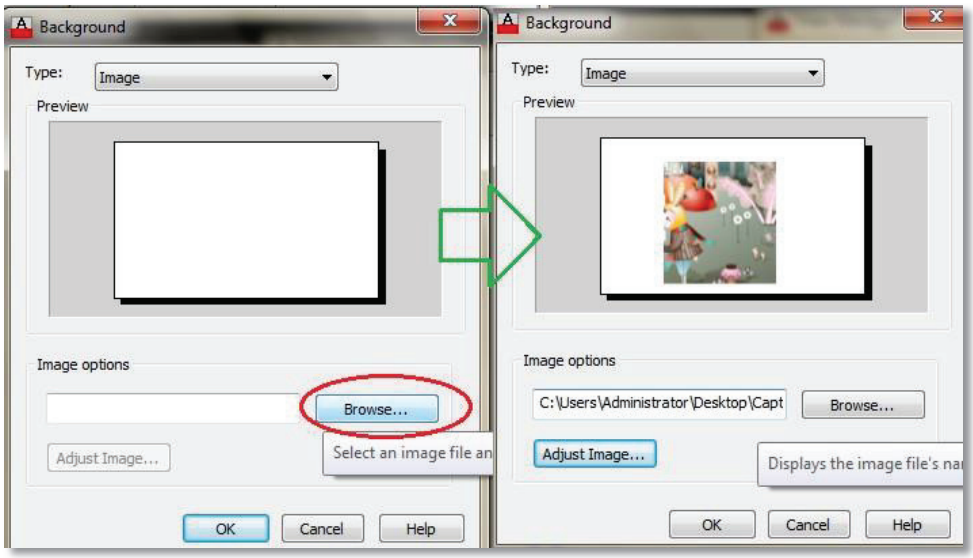
Step-4: After defining the boundary press Enter, you will get back to View Manager Window.



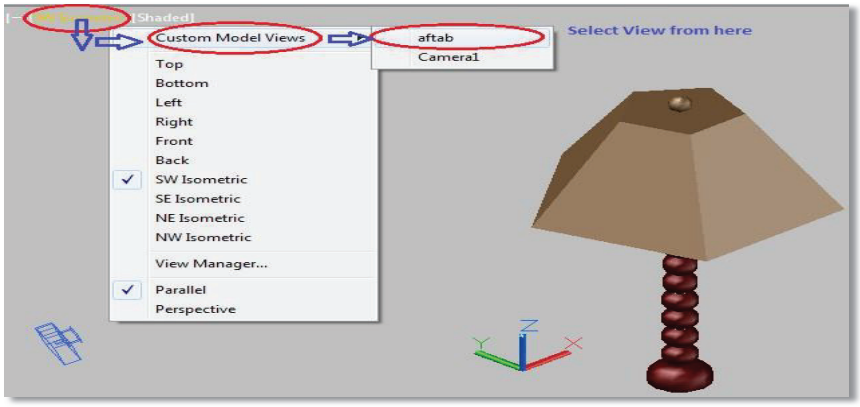
Step-5: Now select background option to apply one of the three option of background as show in figure below.



Step-6: Here we are going select the image option to select image from file and click **Ok** as shown in figure.



Step-7: Select view from view control as follow

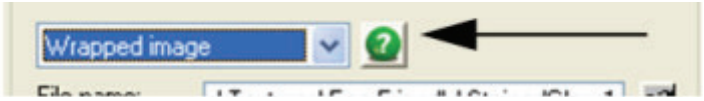


You should get the follow Out Put

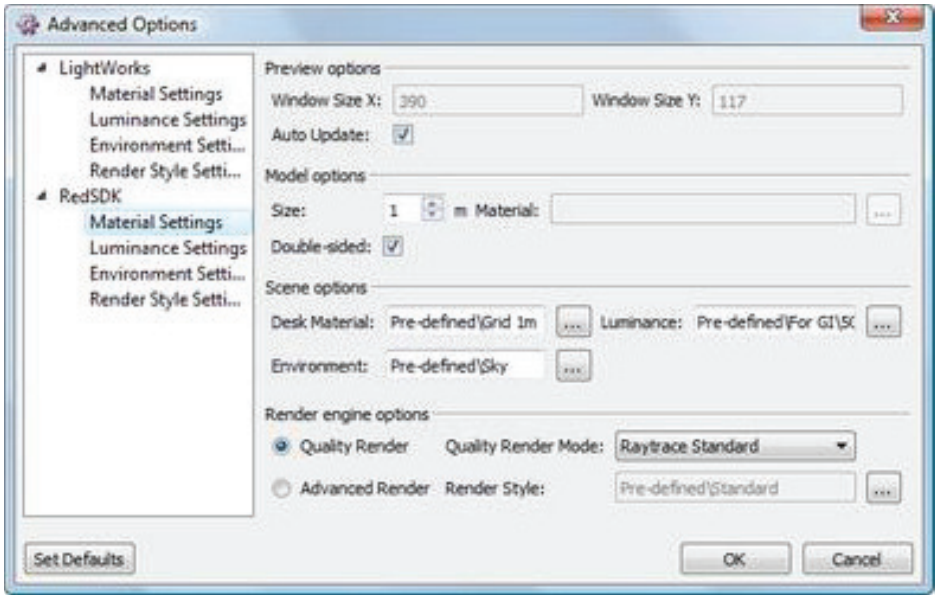
3.4.4. Opacity Control

Opacity is the opposite word for transparency. Each material has five categories of parameters you can set: Pattern, Reflectance, Transparency, Texture and Wrapping. Not all categories are used for each material, only those that are relevant.

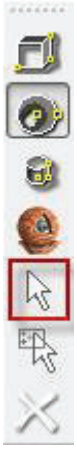
i. Select a material in the Materials Palette
ii. Right click and select Edit Materials.
iii. When the Render Manager appears click the small green help button. This will open the Lightworks help, which is replete with details on functions and settings.



In the **Preview** section, you can change the shape and orientation of the preview object. Under **Options**, you can toggle the display of the preview object or desk. If **Auto Update** is checked, the preview will update each time a change is made (otherwise you must click the **Preview** button).



The toolbar on the right side of the editor allows you to specify the elements of the preview. You can navigate within the preview window using the center mouse button. You can also see approximately how the material will appear on an object by entering a value into the **Model Size** field. Simply specify a size that is close to the size of the object to which you will be applying the material. Alternately, you can use the selection arrow under the preview.



This will show you exactly how the material will appear on the selected object.

Warning: If the selection arrow is the specified option for the preview object, and no object is selected, you will get a warning that a preview cannot be generated. This will also happen if the selection arrow is the default and you open the Render Manager with no object selected.

3.5. Apply Lights.

You will also be able to differentiate between the functionality of different types of light and its implementation in the drawing and get understanding of geographical location setting by specifying the latitude and longitude of a location for the sunlight.

3.5.1. Light

As we know that without a light, the scene cannot be looked attractive and realistic. Rendering has four conceptual steps to develop drawing more realistic.

- Create the model
- Attach materials to objects
- Render the image
- Place lights

We already discussed the first three steps of rendering “Creating the model, attach material and then Render the image or drawing”, the last conceptual step Place lights will we covered in this unit

3.5.2. Creating a Light Source

AutoCAD has four kinds of lighting, each with a distinct method for distributing light rays into the scene. They are as follows:

i. Point Light:

All light rays are emitted from a single location and diverge as they get farther away. An incandescent light bulb is a real-world example of a point light, even though the light does not travel in the direction of the light’s fixture.

ii. Spotlight:

With this type of light, rays are emitted from a single point, but they are restricted to a conical portion of the amount of light that a similar point light would emit. Flashlights and headlights are examples.

iii. Distant Light:

With this type of light, all light rays are parallel. Although the sun is technically a point light, at the enormous distance the light rays travel to Earth, they are nearly parallel

iv. Weblight:

These are photometric lights with real-world distributions. These lights can be used in conjunction with light distributions derived by manufacturers of real-world lights. Using manufacturer data to establish lighting distributions helps ensure more accurate representation of rendered lights than possible when using point or spotlights.

3.5.3. Default Lighting

When there are no lights in a scene, the scene is shaded with default lighting. Default lighting is derived from two distant sources that follow the viewpoint as you move around the model. All faces in the model are illuminated so that they are visually discernible. You can control brightness and contrast, but you do not need to create or place lights yourself.

When you insert custom lights or add sunlight, you can disable the default lighting. You can apply default lighting to the viewport only; at the same time, you can apply custom lights to the rendering.

3.5.4. Turn On/Off the default Lighting

You can turn On/Off the default lighting by using “DEFAULTLIGHTING” command as shown below

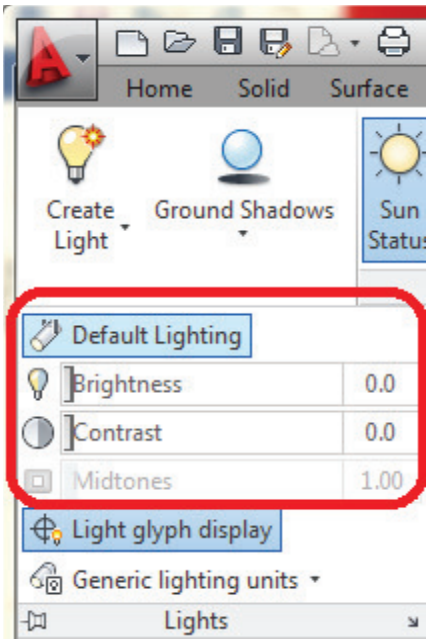
Method-1:

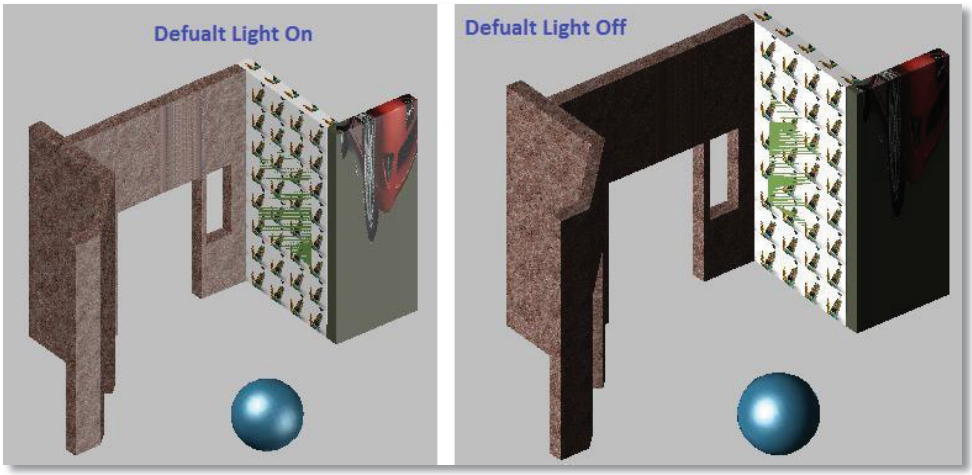
Step-1: Type DEFAULTLIGHTING command in command bar <Enter>

Step-2: Enter an option

- Enter new value for DEFAULTLIGHTING <0>: 1 <For On>
- Enter new value for DEFAULTLIGHTING <1>: 0 <For Off>

Method-2: Follow the figure below.





3.5.5. POINTLIGHT

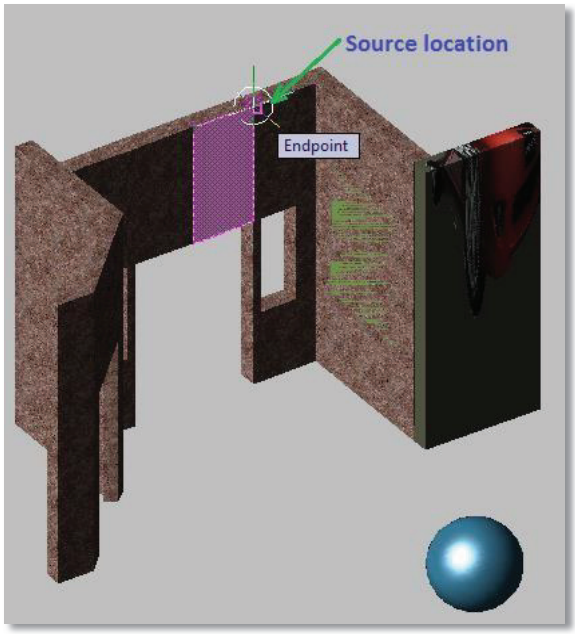
Point light that radiates light in all directions from its location.

Step-1: type **pointlight** command in command bar <Enter>

Or

Click go through 3D Modelling □render tab □Light □PointLight

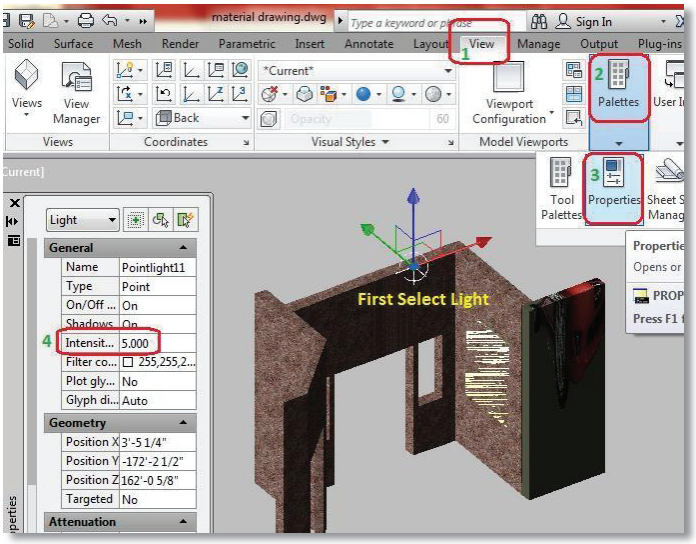
Step-2: Specify source location <0,0,0>: <Click or Define Source Location>



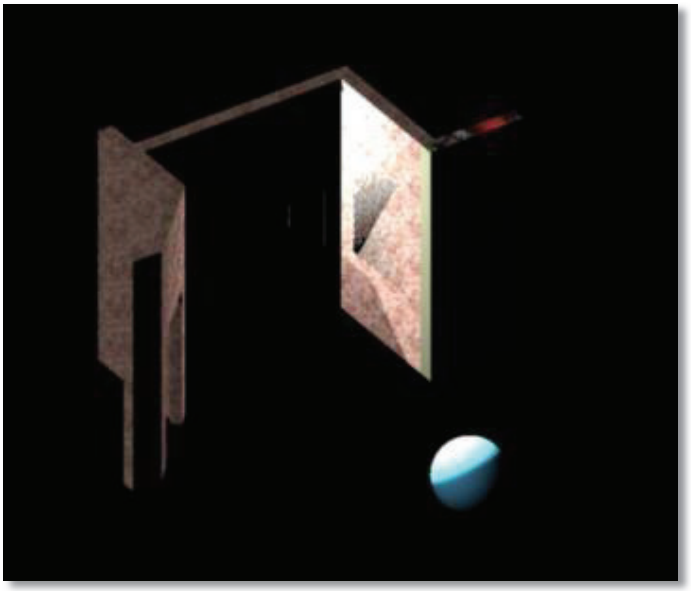
Step-3: Apply Rendering

3.5.6. Photometric Lights

You can control over lighting; you can use photometric lights to illuminate your model. To change the intensity of light, you should follow the following figure step by step.



Apply Rendering



3.5.7. SPOTLIGHT

Spot Light emits a directional cone of light

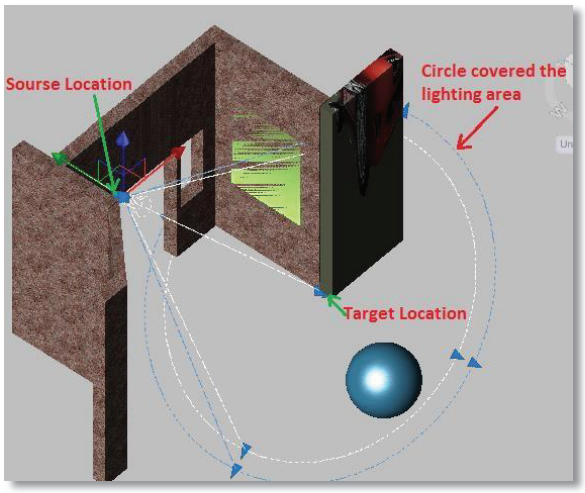
Step-1: type spotlight command in command bar <Enter>

Or

Click go through 3D Modelling → render tab → Light→ SpotLight

Step-2: Specify source location <0,0,0>: <Click or Define Source Location>

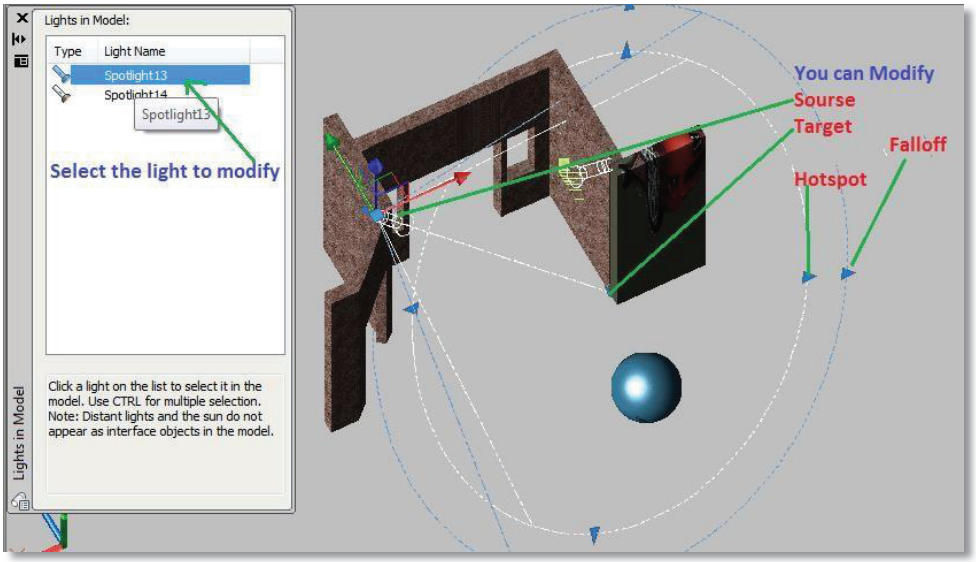
Step-3: Specify target location <0,0,0>: <Click or Define Source Location>



3.5.8. Modification of Lights

You can modify in light target location and area to cover by using LIGHTLIST command.

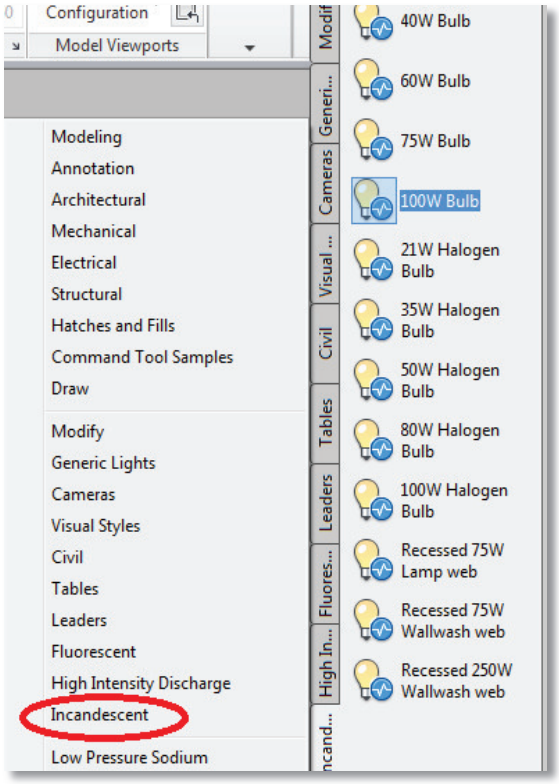
Type LIGHTLIST command in command bar <Enter> you will get the following as shown in the figure below



3.5.9. Lights Tool Palette

Default lights can be added to your drawing from the Tool Palette menus

- **Press Ctrl + 3 From Keyboard to display Light tool palette**



3.5.10. DISTANTLIGHT

Distance light is used for uniform parallel light rays in one direction and mentioning from and to points.

Step-1: type distantlight command in command bar <Enter>

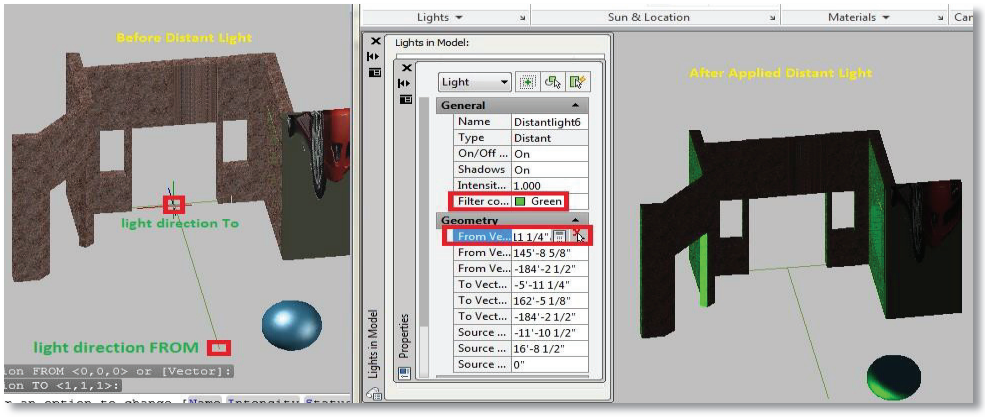
Or

Click go through 3D Modelling →render tab →Light →DistantLight

Step-2: Specify light direction FROM <0,0,0> or [Vector]:: <Click or Define Source Location>

Step-3: Specify light direction TO <1,1,1>: <Click or Define Source Location>

Step-4: Enter an option to change [Name/Intensity/Status/shadoW/Color/eXit] <eXit>: <Enter



3.6. Assign Cameras to execute different Views of Required 3D Model

Camera is used to define a 3D view; you can place camera anywhere in the drawing to define a specific 3D view. You can Set a camera and target location to create and save 3D peSSPective views of objects.
Further you can define its name, height, lens length, and clipping planes. This can ve achieved by the following.

- **3D Navigate control (camera settings, scene creation, Walk, Constrained Orbit, etc.)**

3.6.1. Creating Camera

To Access Camera

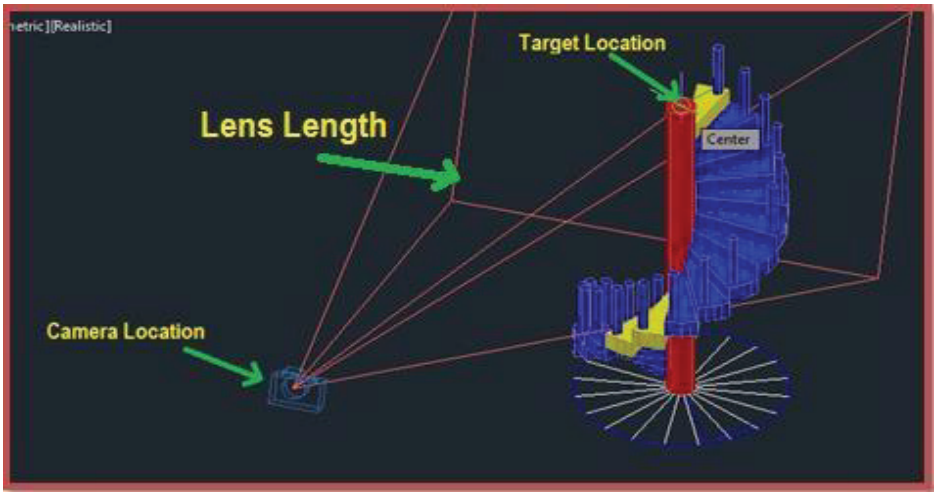
Render Tab	Button	Command Entry
Camera panel → Create Camera		Cam/camera

Step-1: Type **cam/camera** command in command bar **<Enter>**

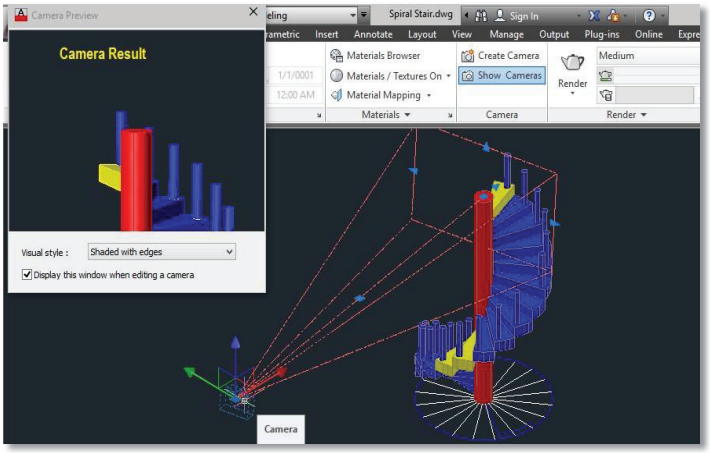
Step-2: Click in the drawing to specify the camera's location.

Step-3: Click again in the drawing to specify a target location.

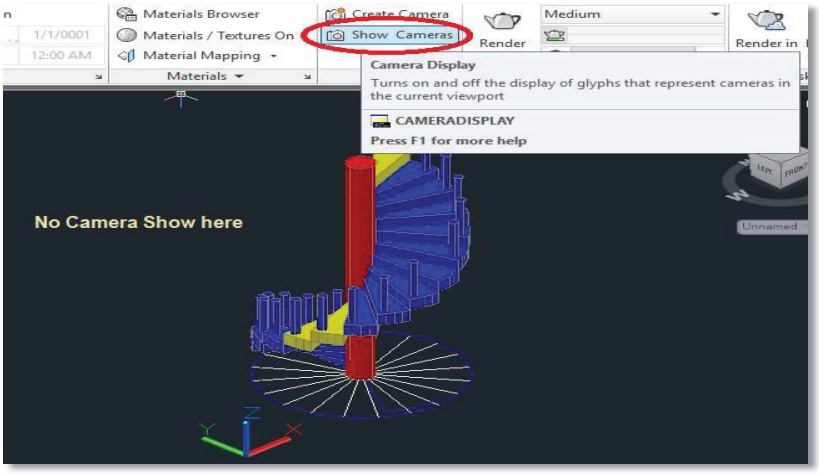
Step-4: Press Enter to Finish, you will get the following as shown in figure below



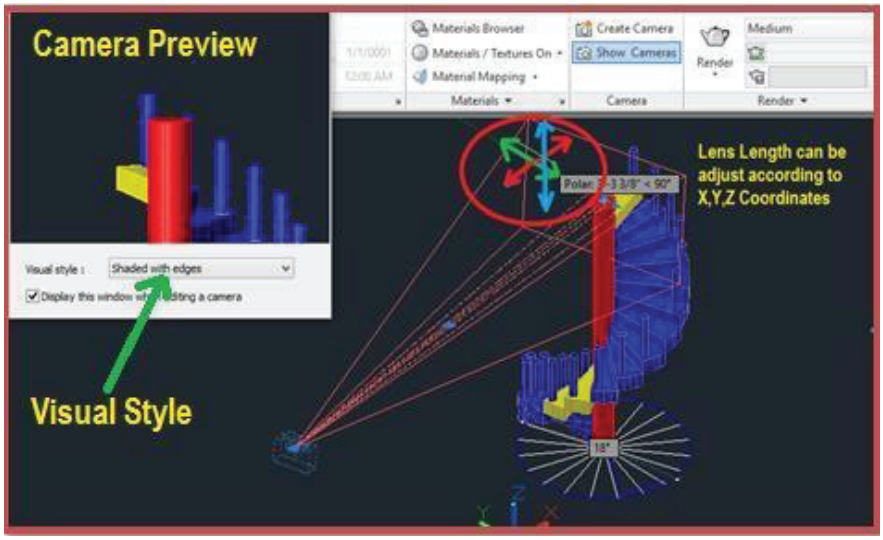
Step-5: To View the Camera, just click the camera location, you will get the following as shown in the figure below



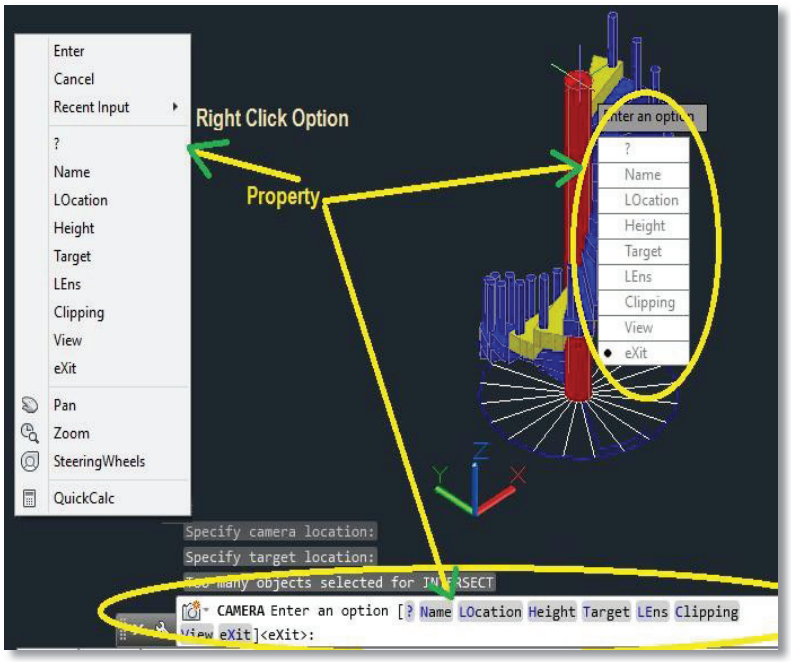
Step-6: You can show/hide the camera by clicking show camera button as shown in figure below



Step-7: Lens length setting can be adjusted according to X, Y and Z coordinates as shown in the figure below.



To further define camera properties, you will get properties on the screen while you setting up camera or you can right-click and select from the list of options.



3.6.2. Camera Properties

Display a list of the currently defined Cameras if any.Just enter the name of

the Camera or press Enter to list all cameras if created.

Name You can Enter Name of the New Camera, if you never enter name of the Camera, by default it willnamed camera1, camera2… so on.

Location Specifies the location of the camera as we discussed previously.

Height You can define or changes the camera height.

Target Specifies the target of the camera as we discussed previously.

Lens Changes the lens length of the camera as we discussed previously.

Clipping Defines front and back clipping planes and sets their values.

3.6.3. Make Animation file in Auto CAD

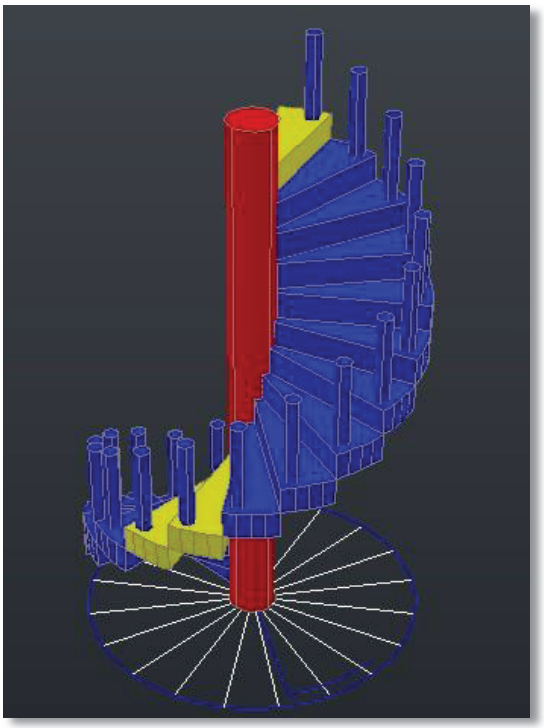
Animation Path is 3D Camera view through which you can view the object/s in as animated motion via a specified path.

In the drawing, you can create a path object for either the camera or the target

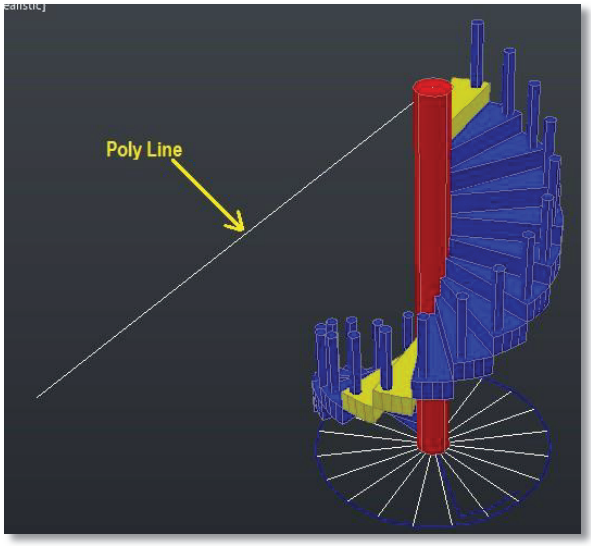
A path can be a line, polyline, 3D polyline, arc, elliptical arc, circle, or spline. To Access Camera

Render Tab	Button	Command Entry
Main Manu → View →Animation.	Animation Motion Path	ANIPATH

We are going to apply animation path on drawing as shown in the figure below.



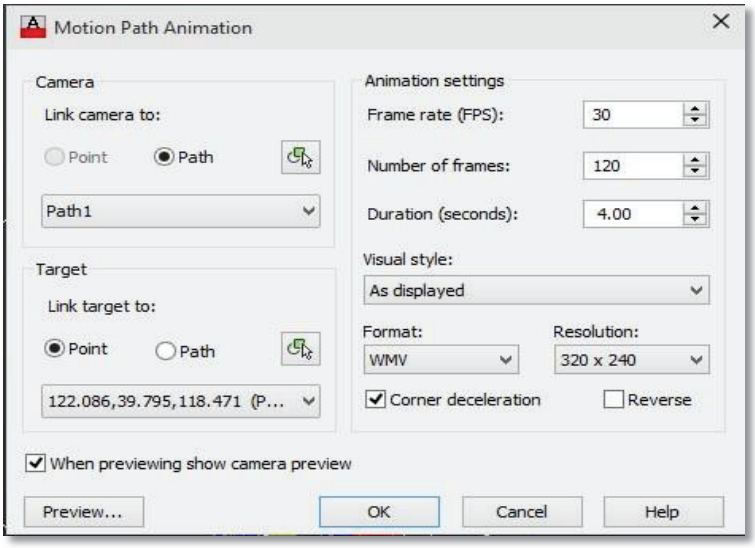
Step-1: Draw a line/polyline to consider a path for animation.



Step-3: Type **ANIPATH** command in command bar or Click Render Tab →Animations panel →Animation Motion Path.

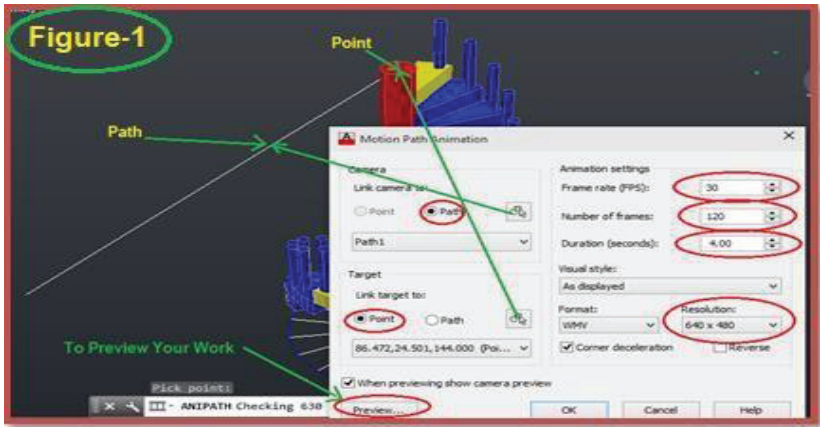
Step-2: In the Motion Path Animations dialog box, do the following:

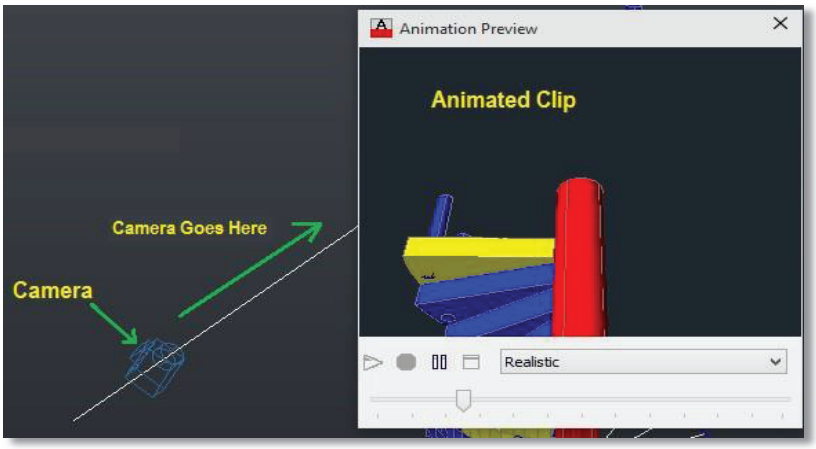
i. Specify a point or path for the camera.
ii. Specify a point or path for the target.
iii. Modify any animation settings as you want.

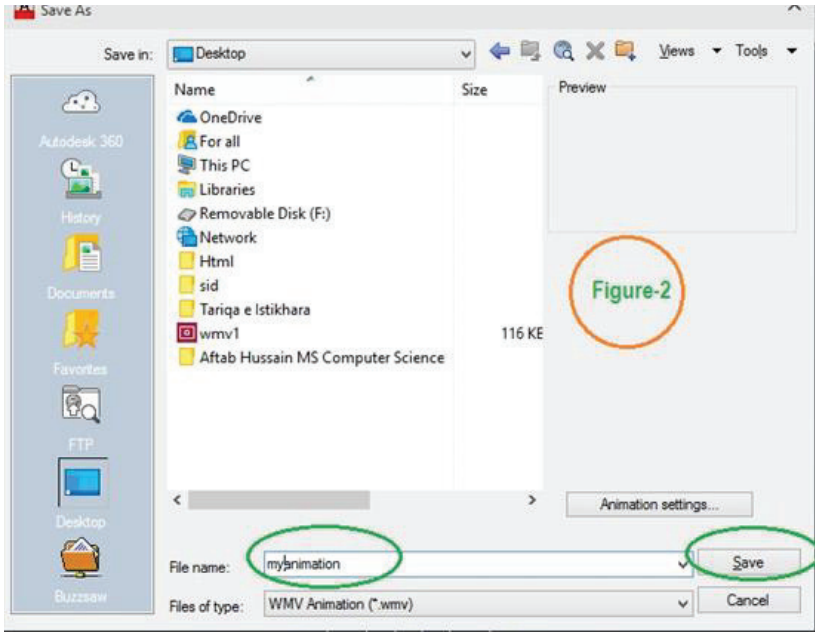


For practice we select.

i. Path for the camera.
ii. Point for the Target.
iii. Click Preview to View your work.
iv. Click OK to save the file as shown in the figure-2.







Output Look like

3.6.4. Walk and Fly

You can simulate walking and flying through a 3D drawing.

When you walk through a model, you travel along the XY plane. When you fly through a model, you are not constrained by the XY plane, so you appear to “fly” over an area in a model.

The following shortcuts are available for walking:

Up arrow / W key

Move forward Down arrow / S key

Move backward Left arrow / A key

Move left Right arrow / D key

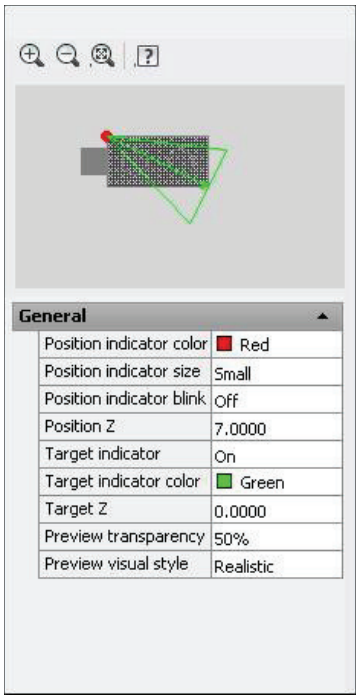
Move right Drag mouse around & turn

Step-1: Open a drawing with 3D objects and display in a 3D view

Step-2: Crate a camera anywhere in the drawing and set the view to that camera

Step-3: 3DWalk or 3DFky at the command prompt. Command: **3DWALK**

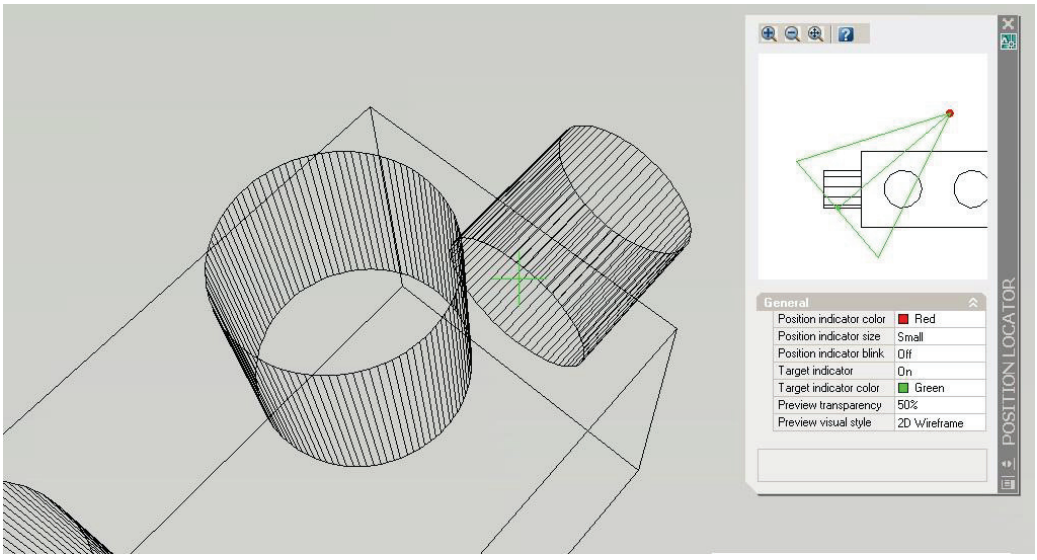
The following Position Locator dialog box will appear that you can use to navigate your drawing.



Step-4: Press the **Up**, **Down**, **Left**, and **Right** keys on the keyboard to see how the camera location moves in the drawing and Position Locator dialog box.

Step-5: Move the camera and target in the Position Locator dialog box

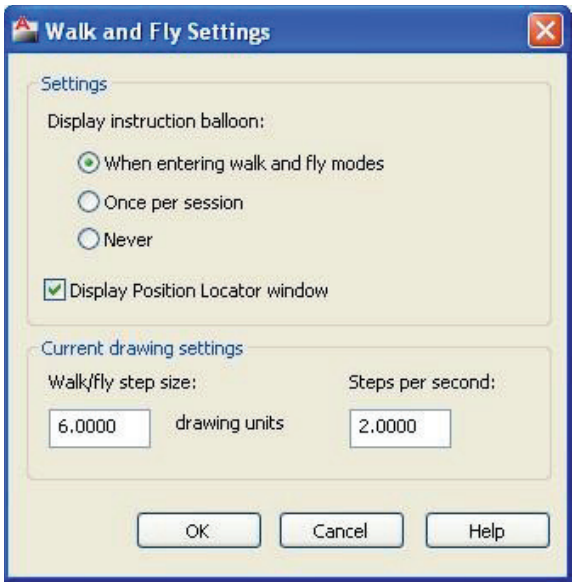
Step-6: Click and drag your mouse to “fly” through the drawing



Step-7: Close the Position Locator dialog box and try walking and flying using only the keys on the keyboard and mouse

3.6.5. Walk and Fly Settings

If you are working in a drawing with a large architectural scale, be sure to set your drawing units to a large number, similar to the scale of the drawing.



- **A-Settings**
  Specifies settings related to the Walk and Fly Navigation Mappings balloon and the Position Locator window.

i. When Entering Walk and Fly Modes

Specifies that the Walk and Fly Navigation Mappings balloon is displayed each time you enter walk or fly mode.

ii. Once Per Session

Specifies that the Walk and Fly Navigation Mappings balloon is displayed the first time in each AutoCAD session that you enter walk or fly mode.

iii. Never

Specifies that the Walk and Fly Navigation Mappings balloon is never displayed.

iv. Display Position Locator Window

Specifies whether the Position Locator window opens when you enter walk mode.

- **B- Current Drawing Settings**
  Specifies walk and fly mode settings specific to the current drawing.

i. Walk/Fly Step Size

Sets the size of each step-in drawing units (the STEPSIZE system variable).

ii. Steps Per Second

Specifies how many steps occur per second (the STEPSPERSEC system variable).

3.7. Render and Print the 3D Model According to Required Size & Orientation

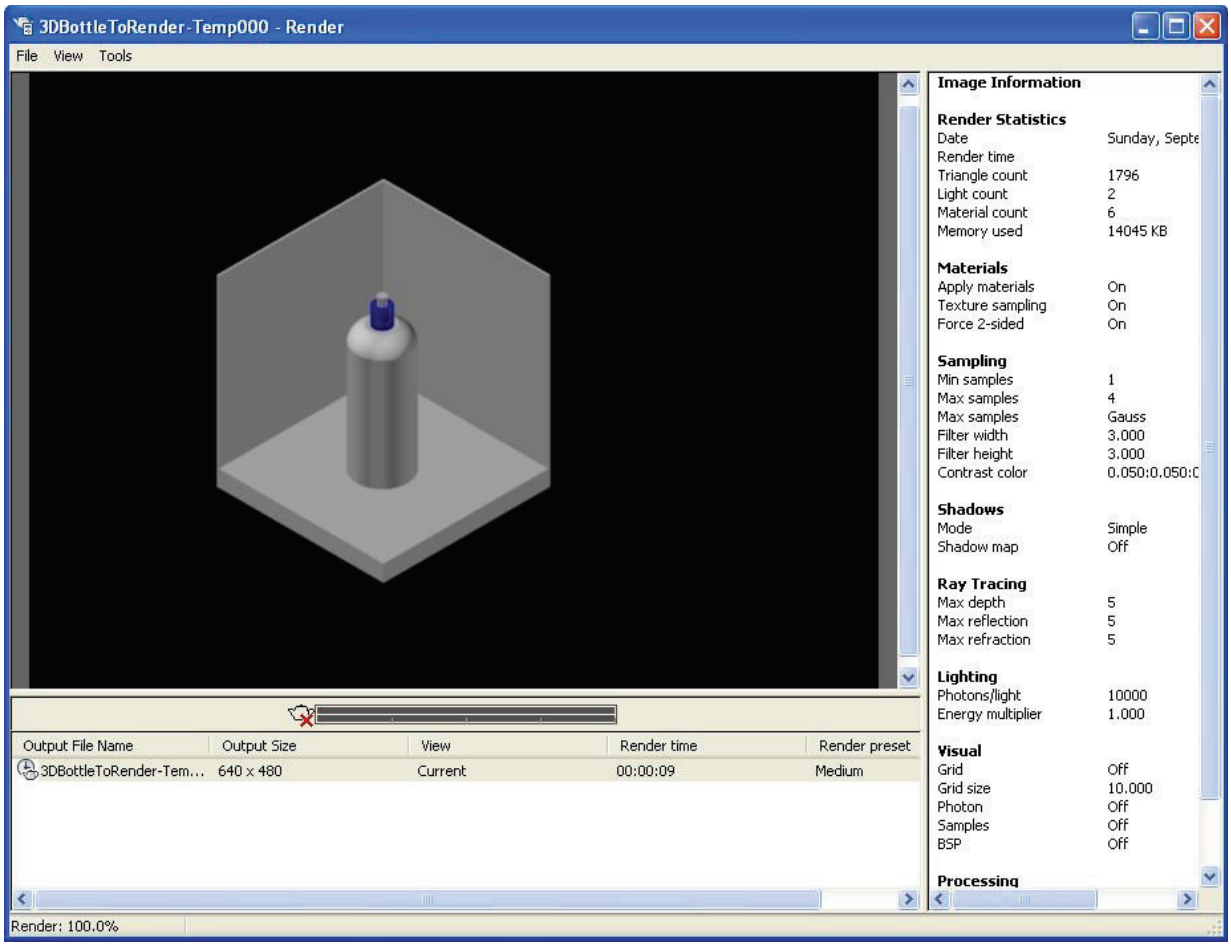
3.7.1. By Render Command

Creates a photorealistic or realistically shaded image of a three- dimensional wireframe or solid model

Step-1: Open an AutoCAD drawing with 3D objects to render

Step-2: RENDER at the command prompt. Command: **RENDER**

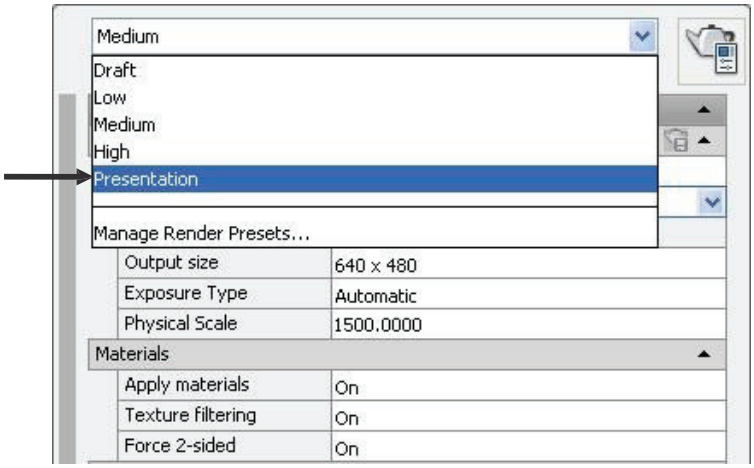
The following render window is the result of default rendering



3.7.2. Render Quality

Step 1: Type RPREF at the command prompt

Step 2: Click the dropdown option for the render quality and choose **Presentation**



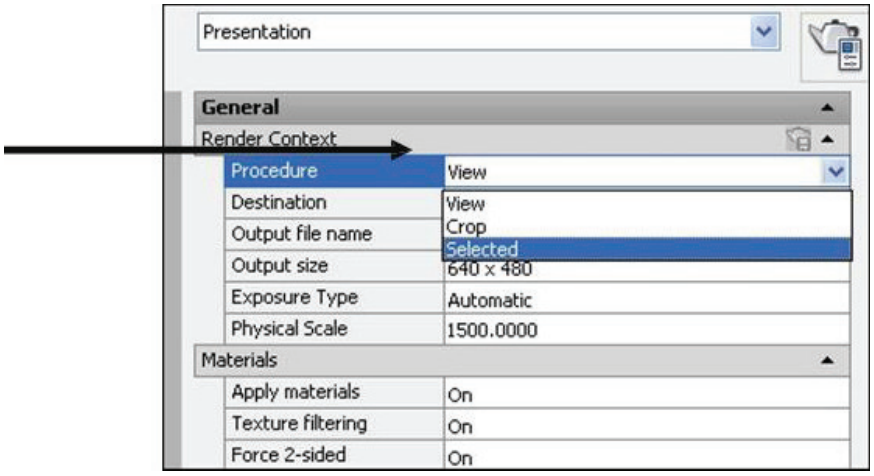
Note: Depending on the objects, lights, materials, etc. In your model, rendering in presentation mode might take a long time

3.7.3. Render Selection

Controls the parts of the model that gets processed during rendering. The render procedure has three settings: View, Crop, and Selected

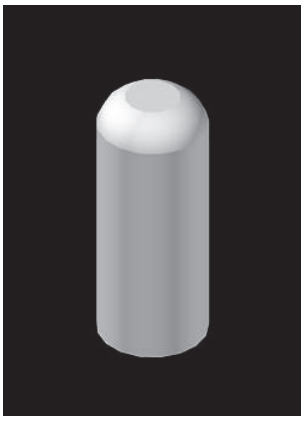
Step 1: Type RPREF at the command prompt

Step 2: The dropdown option for Procedure and choose **Selected**.



The render preferences and render selected objects

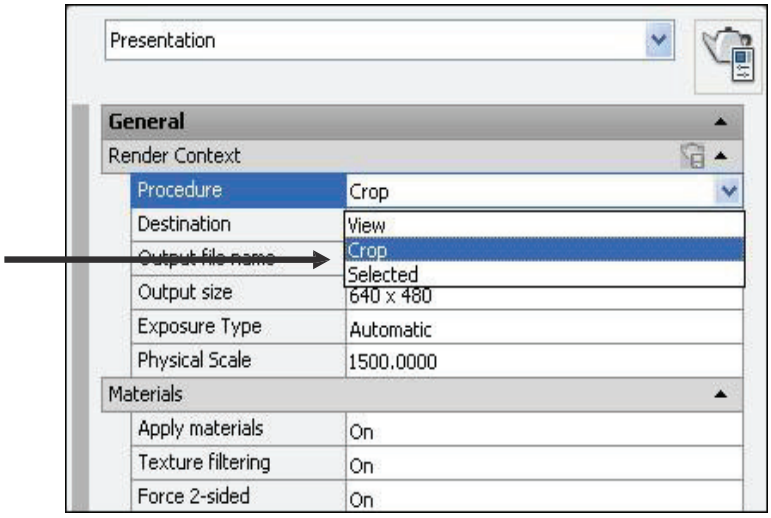
This result is a selected object in the drawing that is rendered.



3.7.4. Render Cropped Window

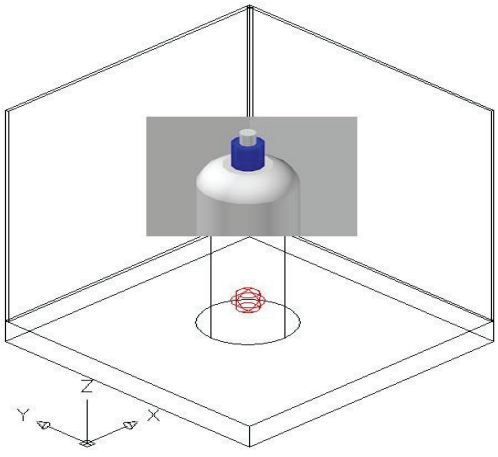
Step 1: Type RPREF at the command prompt

Step 2: The dropdown option for Procedure and choose **Cr**



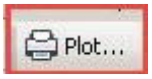
The render preferences and render a cropped window.

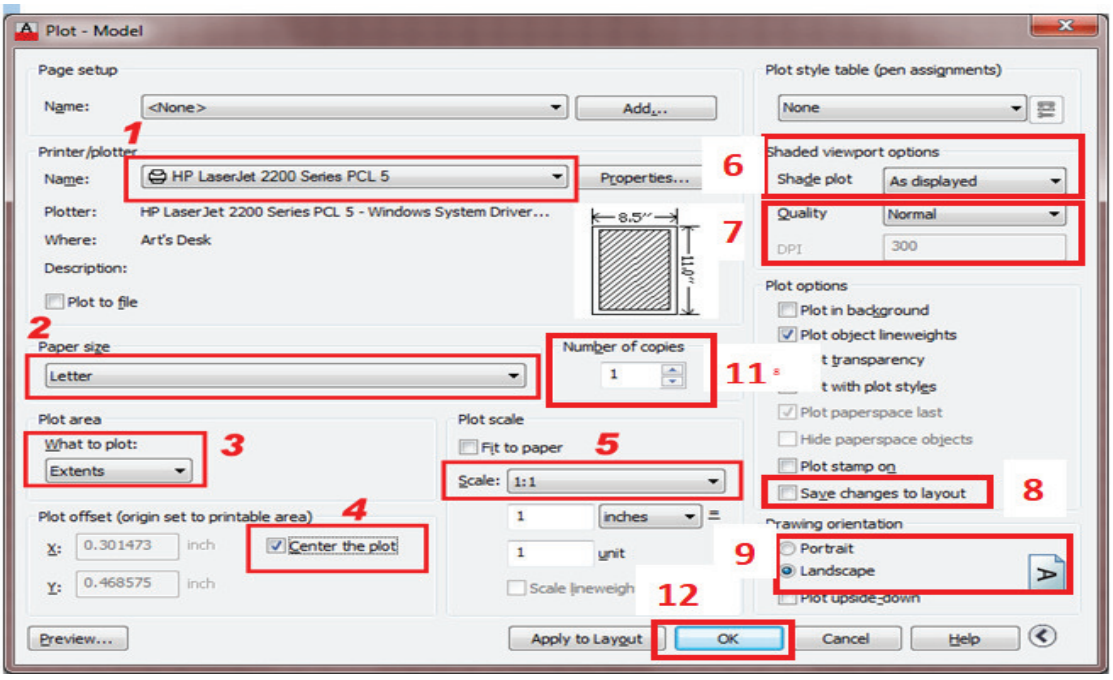
The result is a cropped portion of the drawing that is rendered.



3.7.5. **Print The** 3D MODEL

Step 1: Type PLOT at the command prompt (Ctrl +P)

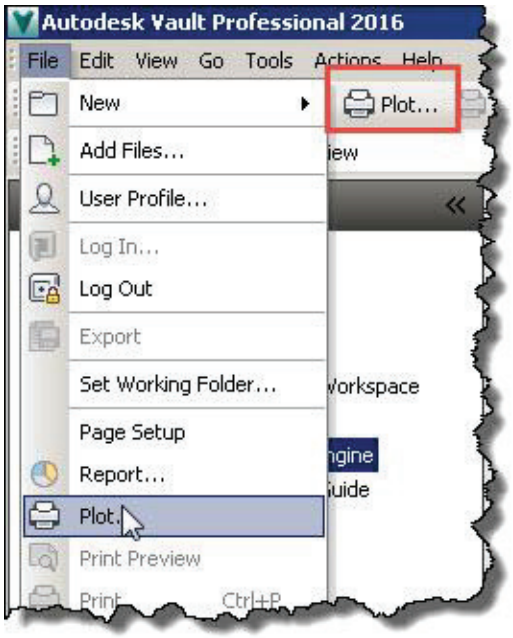
Render Tab	Button	Command Entry
Main Manu → File →Plot.		Ctrl + P



Open the Plot Window

Step 2: Open the Plot window

- **i.** Select Plotter/Printer
- **ii.** Select Page Size
- **iii.** Select Plot area
- **iv.** Center the plot
- **v.** Set the plot Scale
- **vi.** Select shade plot
- **vii.** Select Print Quality
- **viii.** Save the layout
- **ix.** Select drawing Orientation
- **x.** Preview
- **xi.** Set number of copy
- **xii.** Ok



3.7.6. Constrained 3D Orbit

3DORBIT activates a 3D Orbit view in the current viewport. You can view your entire drawing or select one or more objects before starting the command.

When 3DORBIT is active, the target of the view stays stationary and the camera location, or point of view, moves around the target. However, from the user's point of view, it appears as if the 3D model is turning as the mouse cursor is dragged. In this way, you can specify any view of the model.

Open a drawing with 3D objects.

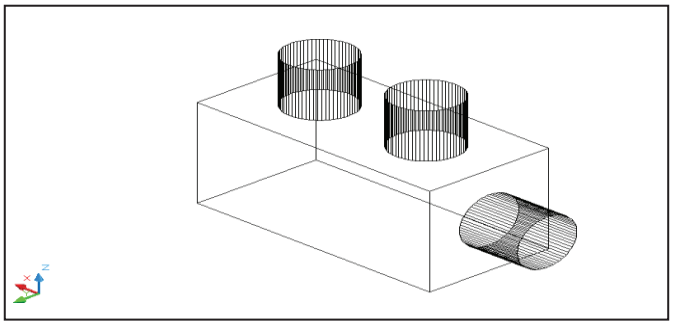
Choose View, Orbit, Constrained Orbit.

or

Type 3D Orbit at the command prompt.

Command: **3DOrbit**

Click and drag to move your object in 3D.



3.7.7. Zoom and Pan in 3D Orbit

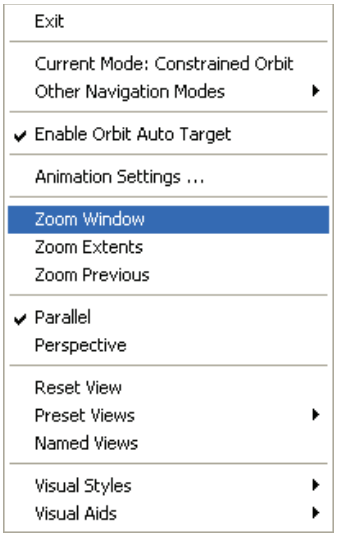
Click the **right mouse** button while in the 3D Orbit command.

Choose **Zoom Window** from the pop-up menu.

Zoom to a new area of the 3D drawing.

Click the **right mouse** button while in the 3D Orbit command.

Choose **Zoom Previous** or **Zoom Extents**



- **Pan**
  Click the **right mouse** button while in the 3D Orbit command.
  Choose **Other Navigation Modes** from the pop-up menu.
  Choose **Pan**.
  Pan to a new area of the drawing.
  Click the **right mouse** button while in the 3D Orbit command.
  Choose **Other Navigation Modes** from the pop-up menu.
  Choose **Constrained Orbit** to set the mode back to orbit

PRACTICES

Practice-1

Create and Apply wood material with the following material settings to previously created object in AutoCAD

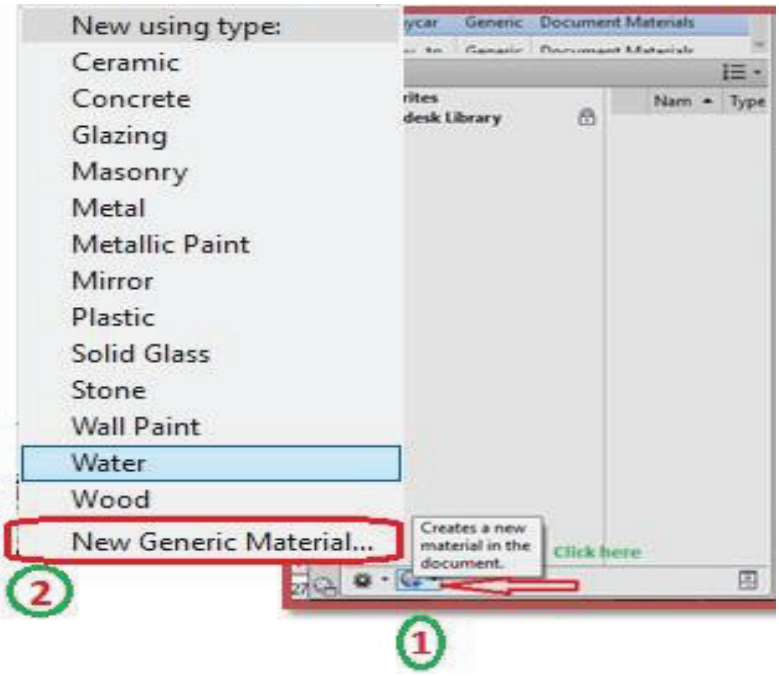
- Opacity 70%
- Adjust Bitmap setting

i. Fit to object
ii. Un check tiles
iii. Visual style: realistic.

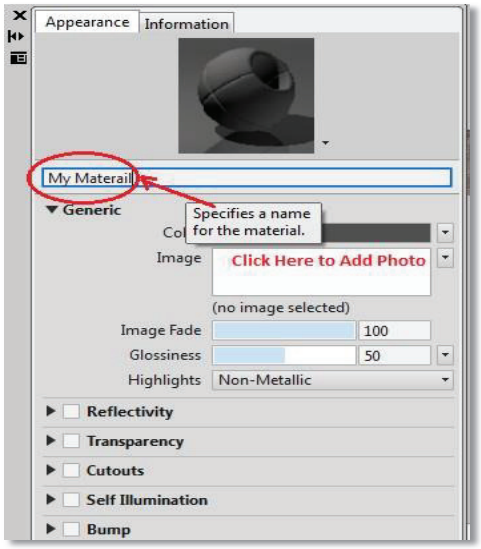
Step-1: Type materials command in command bar or click Browse Material

Render Tab	Button	Command Entry
Material → Browse Material.		Marbrowseropen

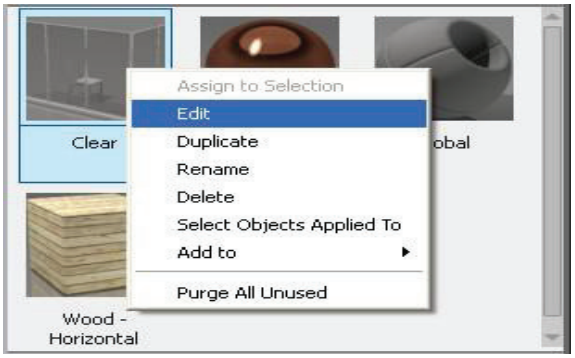
Step-2: Create **New Material** Option as shown in the figure below.



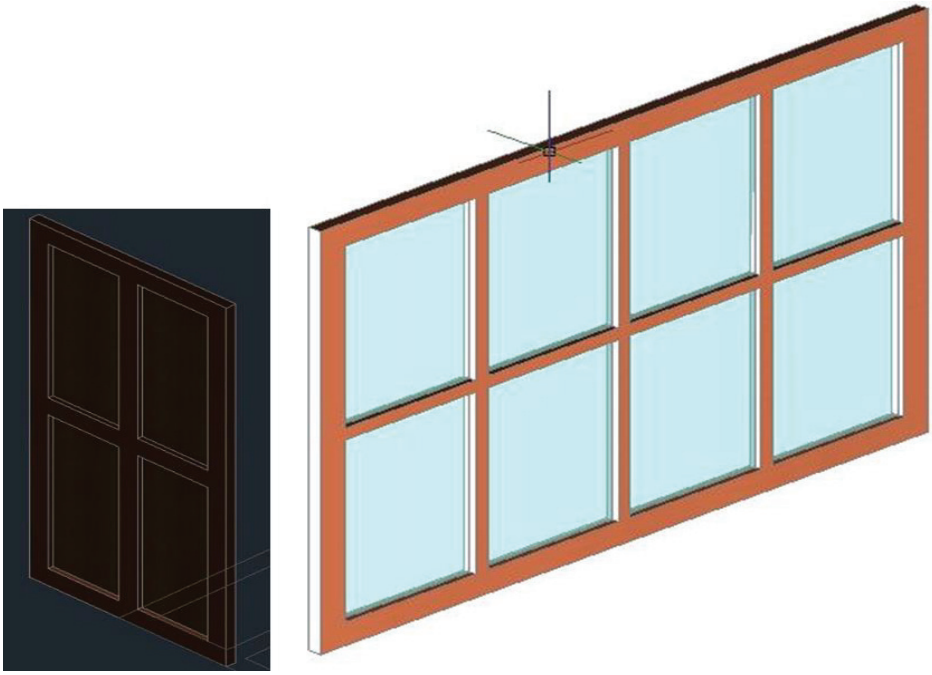
Step-3: Click a **New Generic Material** and then follow steps as described in the figure below Write down step. Set the Transparency= 30% which will result 70% opacity.



Step-4: Right-click a material in the Document Materials section and click Edit



Step-4: Render the viewport to see the material changes
Step-5: Change one or more properties of the material. Select wood material e.g. door and window as under



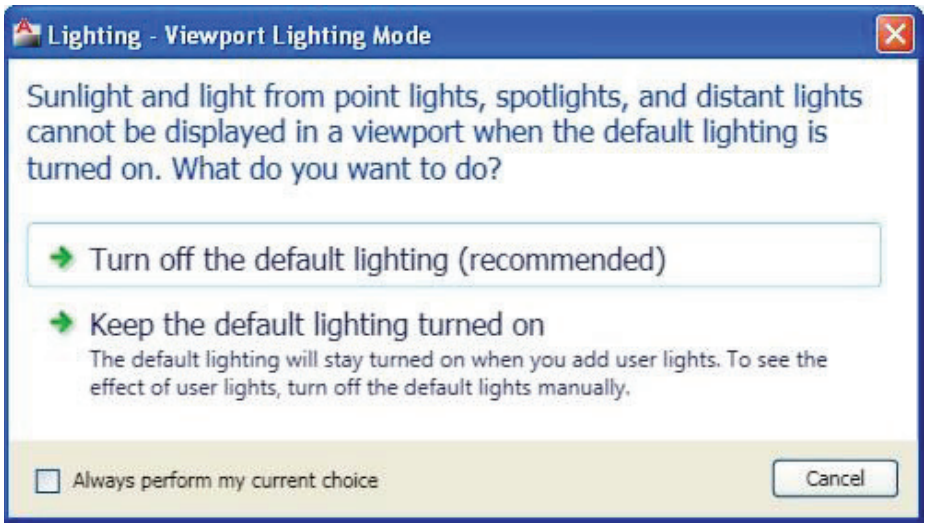
Practice-2

Apply spot and point light to previously created drawing and then **render** the drawing to show applied materials and lights.

- **Point Lights**
  A point light radiates light in all directions from its location

Step-1: Type **POINTLIGHT** at the command prompt → Enter

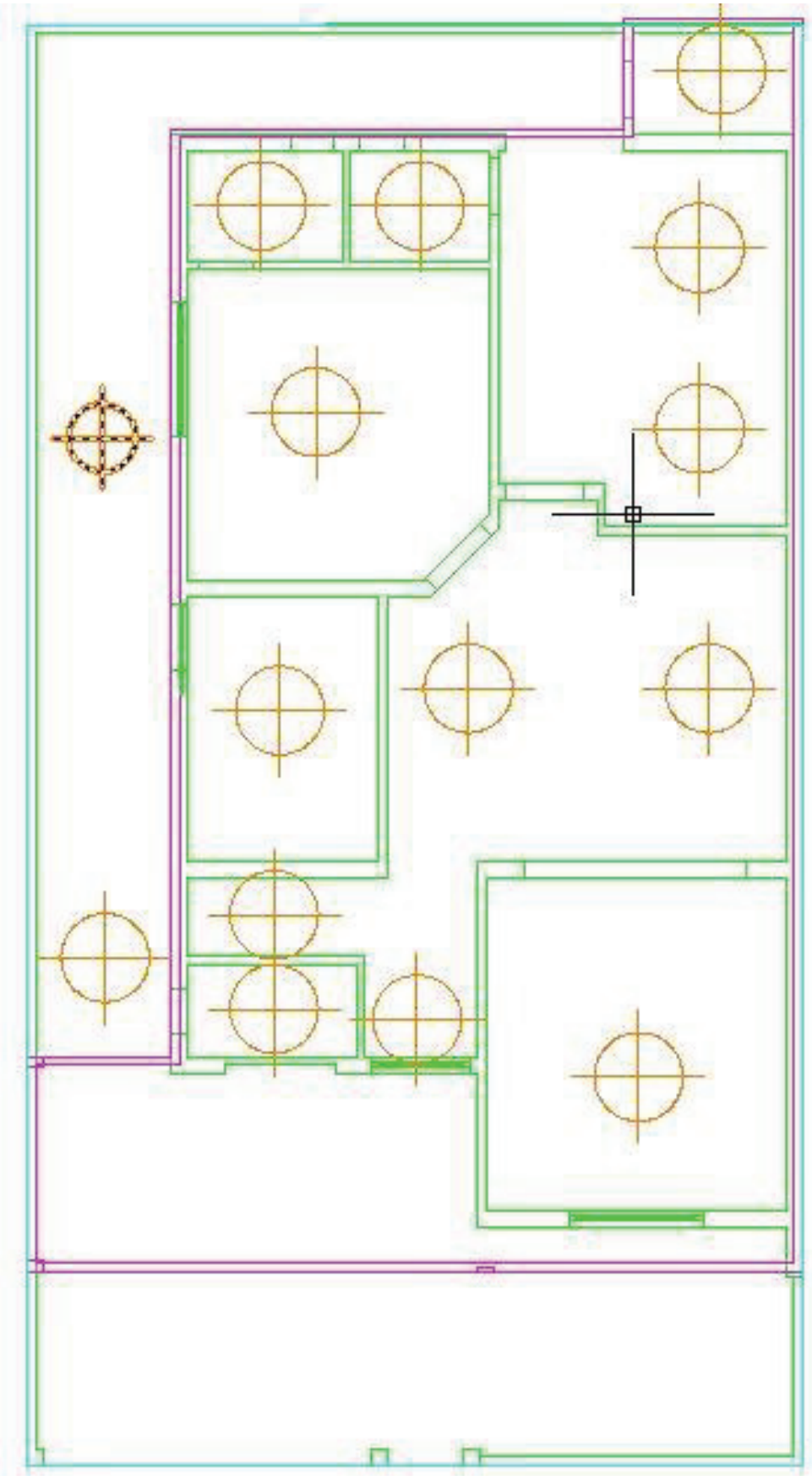
Step-2: Turn Off default lighting in the following prompt if default lighting was on:



Step-3: Specify source location <0,0,0>: **.XY** of pick bottom center of bottle (need Z): **15**

Step-4: Enter an option to change [Name/Intensity/Status/shadoW/Attenuation/Color/eXit] → Enter

Step-5: Render the current viewport View rendered using a point lite. Select the locations of the point lights as shown in the following drawings. Change light settings as per room requirements.



SPOTLIGHT

A spotlight emits a directional cone of light.

Step-1: Type **SPOTLIGHT** at the command prompt → Enter

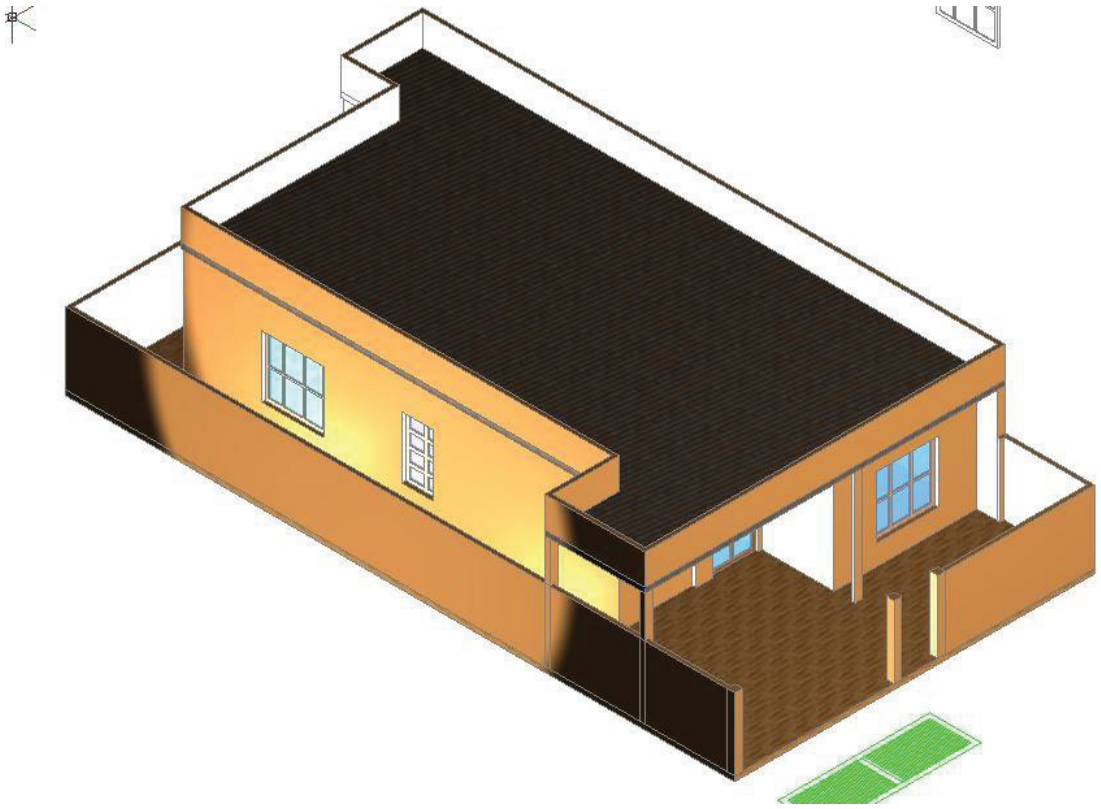
Step-2: Specify source location <0,0,0>: **P1**

Specify target location <0,0,-10>: **P2**

Enter an option to change [Name/Intensity/Status/Hotspot/Falloff/shadoW/ Attenuation/Color/eXit] <eXit>: **press enter**

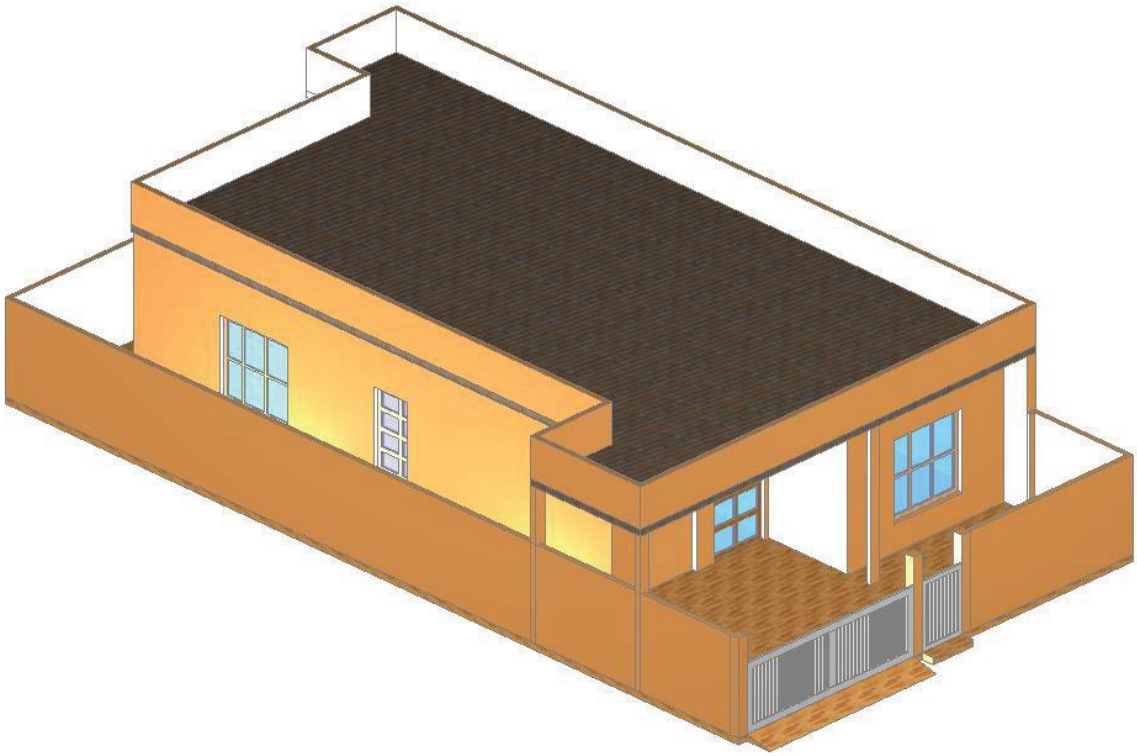
Step-3: Render the current viewport View rendered using a spotlight.

One spot light from front and from left side.



Step-4: Render the current viewport View rendered using a spotlight.

One spot light from front and from left side with main gate.



Summary of Module

With the completion of this module we acquainted with the AutoCAD 3D Orbit functionality to rotate the view in 3D space constrained to horizontal and vertical orbit, freely orbiting and continuously orbiting on selected object/s and drawing. We also covered different visual styles, visual aids, preset views and fly and walk view with the collaboration of parallel and peSSPective projections mode.

We learnt about the camera setting for the objects in the drawing and created different position for the camera in the drawing to visualize the object/s from different sides and applied dynamic view for parallel and peSSPective
projection by using a camera and target with the help of DVIEW command. We also learnt the command ANIPATH for motion path animation along the XY plane, and saved the animation file of a camera moving and panning in a 3D model.

We learnt the concept of solid-filled area by using its pre-defined command in AutoCAD, filled two types of polygonal areas like triangular areas and quadrilateral area with different colors and FILLMODE ON/OFF concepts as well. Further we covered making of 3D Faces with Invisible and visible edge concepts by using pre-defined command 3Dface and edge.

In addition we learnt about fundamental mesh primitive command by which we can reshape mesh objects by using various Mesh command such as mesh box used to create rectangular or cubical mesh box, Mesh cone used to draw cone, Mesh cylinder used to create cylinder of varying radius, Height, Mesh pyramid of inscribed / circumscribed perimeter, Mesh wedge and Mesh torus which was used to create ring shape surface of two radius value. We also learnt about the adjustment of the smoothness of mesh and how to add or remove mesh crease which helped you to sharpen or crease the edges of mesh objects. Editing meshes command such as Mesh extrude, Mesh split, Merge face, Mesh cap, helped you to edit mesh as you considered necessary.

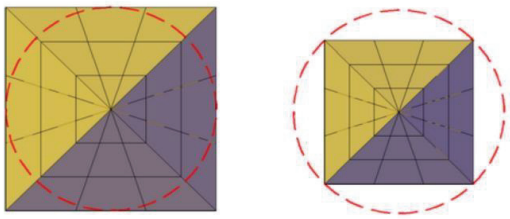
Question and Answers:

FAQ - 1 **Use of Polysolid Command?**

Answer : You can create walls with straight and curved segments of constant height and width. With the POLYSOLID command,

FAQ - 2 **Define inscribed or circumscribed perimeter?.**

Answer : Specify whether the pyramid base is drawn inside or outside of the radius



Circumscribed *Inscribed*

FAQ - 3 **How can you select face of 3D object?**

Answer : Press Ctrl+Click to select faces and edges on 3D objects.

FAQ - 4 **What is the use of loft command?**

Answer : LOFT command creates a solid by joining several crass sections lying on different

FAQ - 5 **Which command is used to hollow the object?**

Answer : Shell command

FAQ - 6 **Which command is used to color the face of an object?**

Answer : Color faces

FAQ - 7 **What is the location of modify solid tools?**

Answer : Main menu→modify→solid editing→solid editing tools

FAQ - 8 **How many options of extrude faces?**

Answer : Two
1: height 2: path

FAQ - 9 **How can we pick the imprint command from menu?**

Answer : Main menu→modify→solid editing→imprint

FAQ - 10 **How could you get render crop?**

Answer : You can get render crop by using rendercrop command or from 3D Modelling→render tab→render region.

FAQ - 11 **How could you display rendered windows without rendering option?**

Answer : You can get render windows from 3D-Modelling→render tab→render windows.

FAQ - 12 **How could you switch between different rendered windows without rendering option?**

Answer : Go through 3D-Modelling→render tab→render windows and switch between different render windows if you created with different setting.

FAQ - 13 **Is there any option to off material applied to an objects by using RPREF command?**

Answer : Yes! You can turn off material by using RPREF command in Materials option of Advance Rendering Properties.

FAQ - 14 **How can you search for materials?**

Answer : You can search for materials via search bar in Browse Materials dialog box

FAQ - 15 **How could you display Camera in render Tab, if camera option is not displayed?**

Answer : If the camera option is not displayed on the Visualize tab, right-click the Visualize tab and click panels → camera

FAQ - 16 **What is the purpose of EXTRUDE command?**

Answer : Creates a 3D solid or surface by extending the dimensions of an object in z-axis.

FAQ - 17 **What is a spot light?**

Answer : With this type of light, rays are emitted from a single point, but they are restricted to a conical portion of the amount of light that a similar point light would emit. Flashlights and headlights are examples.

FAQ - 18 **What is a point Light?**

Answer : All light rays are emitted from a single location and diverge as they get farther away. An incandescent light bulb is a real-world example of a point light, even though the light does not travel in the direction of the light's fixture.

FAQ - 19 **What is the purpose of 3D Rotate?**

Answer : 3D Rotate command helps to constrain or in rotation of 3D objects and sub-objects along any axis up to a specified angle

FAQ - 20 **What is the difference between Transparency and Opacity?**

Answer : Transparency is the opposite of opacity. Transparent materials have visualization through them. Whereas the opaque materials have no visualization through them.

FAQ - 21 **What is the difference between Move and 3D Move?**

Answer : Move command moves an object in two directions i.e. along x and y-axis. Whereas 3D Move command can move an object in three directions i.e. along x, y, and z-axis.

FAQ - 22 **Prepare list of Boolean operations.**

Answer : (1) Union (2) Subtract (3) Intersect

FAQ - 23 **What is meant by Boolean Operations?**

Answer : The Boolean commands work only on solids or regions. The first stage in a solid model creation consists in obtaining one or more primitives. The next stage consists in using Boolean operations of Union, Subtract or Intersect in order to create the solid model.

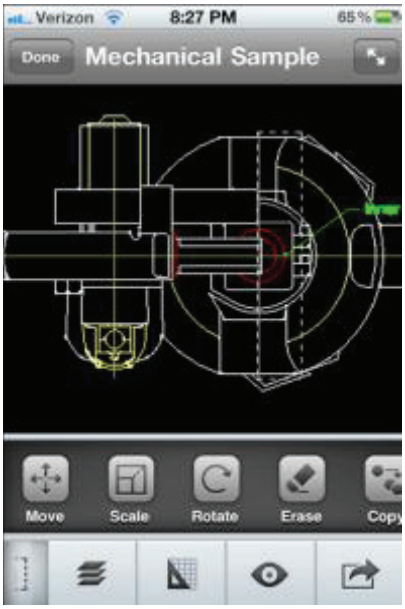
FAQ - 24 **What is the function of vertical integration IN AutoCAD?**

Answer: The *vertical integration program is used by AutoCAD* to enrich the architectural *designing of a 3D object*. It includes elements that contain data as well as simple objects such as circles and lines. The information is structured to display the architectural products and the files that are extracted. These can be again worked as per the requirement.

FAQ - 25 **What is the use of variant in AutoCAD?**

Answer: Variants are utilized in AutoCAD to assist in the creation, conceptualization, and rendering of the 3D models that incorporate 3D printing as well. They enable you to employ the functionality of the various application as per the need.

FAQ - 26 **How you can create a user interface in Autocad?**



Autocad Interview Questions

Answer: User interface can be created by using the command prompts to draw the plots and dialog boxes. The dialog boxes can be displayed by the use of PLOT command and the external database commands (ASE). Setting of CMDDIA to 1, allows the dialog boxes to run the command. The user interface creation also needs the command line to display the entire file so that it can be edited or customized easily

FAQ - 27 **What is the use of variant in Autocad?**

Answer: In Autocad variants are used to help in creation, visualizing and rendering the 3D models that include 3D printing as well. Variants allows you to use the functionality of different application according to the requirement.

FAQ - 28 How can you make a spring, spiral or screw thread?

Answer: To make a spiral or screw thread use an AutoLISP routine such as spiral.1sp, it will create a spiral path according to your need. Then you can use EXTRUDE command with a reference object, using the spiral as the path. Also, there is another way you can do this, by using Mechanical Desktop (MDT) or Autosurf by using augmented lines as path.

FAQ - 29 What is Wireframes ?

Answer: A wireframe model is a skeletal description of a 3D object. There are no surfaces in a wireframe model; it consists only of points, lines, and curves that describe the edges of the object. With AutoCAD you can create wireframe models by positioning 2D (planar) objects anywhere in 3D space. AutoCAD also provides some 3D wireframe objects.

FAQ - 30 What is Solids modeling ?

Answer: Solid modeling is the easiest type of 3D modeling to use. With the AutoCAD solid modeler, you can make 3D objects by creating basic 3D shapes: boxes, cones, cylinders, spheres, wedges, and tori (do-nuts). You can then combine these shapes to create more complex solids by joining or subtracting them or finding their intersecting (over-lapping) volume. You can also create solids by sweeping a 2D object along a path or revolving it about an axis.

Test Yourself

Multiple Choice Questions (MCQs)

1) The Model which is created by using basic entities of 2-dimenstioning is called_____.
   a) Surface model
   b) Wire frame model
   c) Solid model
   d) Isometric model

2) Type of model which is commonly used are_____.
   a) Simple model
   b) Composite model
   c) Isometric model
   d) Solid model

3) In which of the type of wire frame model is used for drawing flat objects_____?.
   a) 2D wire frame model
   b) 2.5 wire frame model
   c) 3D wire frame model
   d) Solid model

4) The _____ form the bases for surface models.
   a) Surface model
   b) Solid model
   c) Wire frame model
   d) Isometric model

5) The wire frame entities are_____?
   a) Plane surface
   b) Ruled surface
   c) Tabulated surface
   d) Polygons surface

6) AutoCAD 3D basic ribbons are_____.
   a) Home
   b) Render
   c) Insert
   d) All of above

7) AutoCAD 3D modeling ribbons are_____?

a) Surface

b) Mesh

c) Render

d) All of above

8) The representation of complex object which is not to be drawn by wireframe model is called_____.

a) Surface model

b) Wire frame model

c) Solid model

d) Isometric model

9) For the creation of pyramid, the option is_____.

a) Sides

b) Edges

c) Frustum

d) a, b and c

10) What is the usefulness of view ports_____?

a) Allow us to see the screen or on paper different views of the same project.

b) Give us the ability to see projects have become a newer version of AutoCAD from ours.

c) We can make a change in one part of the plan, without effecting the rest.

d) None of the above

11) To print the entire project, you will choose to regulate what to plot?

a) Display

b) Extends

c) Limits

d) Windows

12) Which of the following is NOT a property of an object?

a) Line weight

b) Measure

c) Hyperlink

d) Elevation

13) Which command convert discrete object in polyline?

a) Union

b) Subtract

c) Join

d) Polyline

14) The primary difference between the model tab and the layout tab (s) is _____.

a) The model tab is used for drawing 3D and a layout is used for drawing in 2D.

b) The model tab is where you create the drawing a layout tab represents the sheet that you will plot are print on.

c) The color of the background

d) The model tab displaces the drawing you are coping from and the layout tab is where your layout the new drawing.

15) What is the purpose of copy faces command?

a) Copy faces

b) Copy Edge

c) Copy object

d) Both a and b

16) From which menu, we can pick the 3D move?

a) Draw

b) Modify

c) Format

d) Dimension

17) What is the use of copy faces?

a) Faces extrude height

b) Copy faces

c) Move faces

d) None of these

18) How many options of extrude faces are available?

a) Two

b) Three

c) Five

d) Seven

19) What is the purpose of shell command?

a) To Cut the object

b) To change the plane

c) To hollow the object

d) None of these

20) Which Visual Styles must be in ---------- view while you apply materials?

a) Conceptual View

b) Realistic View

c) Hidden View

d) None

21) Command for Advance Render Properties?

a) RPREF

b) RENDER

c) RPROP

d) Both b and c

22) Command for Materials Attach to an entire layer?

a) Materials

b) Materiallist

c) Materialattach

d) None

23) Command for material mapping?

a) Material Mapping

b) Material map

c) Material

d) Materialist

24) Command used for Light list is ----------?

a) LIGHTLIST

b) LIST

c) LLIST

d) Both b and c

25) 3D Orbit is used to revolve?

a) Entire Drawing

b) Only selected object

c) Selected and entire drawing

d) None

26) Short cut key for Free Orbit.

a) Ctrl + Click

b) 3DFORBIT

c) FORBIT

d) Both b and c

27) Fly orbit works in_____.

a) Parallel view

b) Only Perspective viewSSP

c) Both Parallel and perspective

d) None

28) ECS button is used to?

a) Reset the view

b) Delete the object

c) Exit the active command

d) None

29) Command for zoom orbit?

a) Z

b) 3DZ

c) 3DZOOM

d) Both b and c.

30) What will happened if you used solid extrude command on an open 2D Geometry.

a) It will not create extrusion

b) It will extrude a surface

c) Command line will from you to make closed boundary before using extrude command

d) Region will be created from extrusion

Answers key:

1	B	2	D	3	A	4	B	5	D
6	D	7	D	8	A	9	D	10	A
11	C	12	B	13	C	14	B	15	D
16	B	17	B	18	A	19	C	20	B
21	A	22	C	23	B	24	A	25	C
26	B	27	B	28	C	29	C	30	B

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