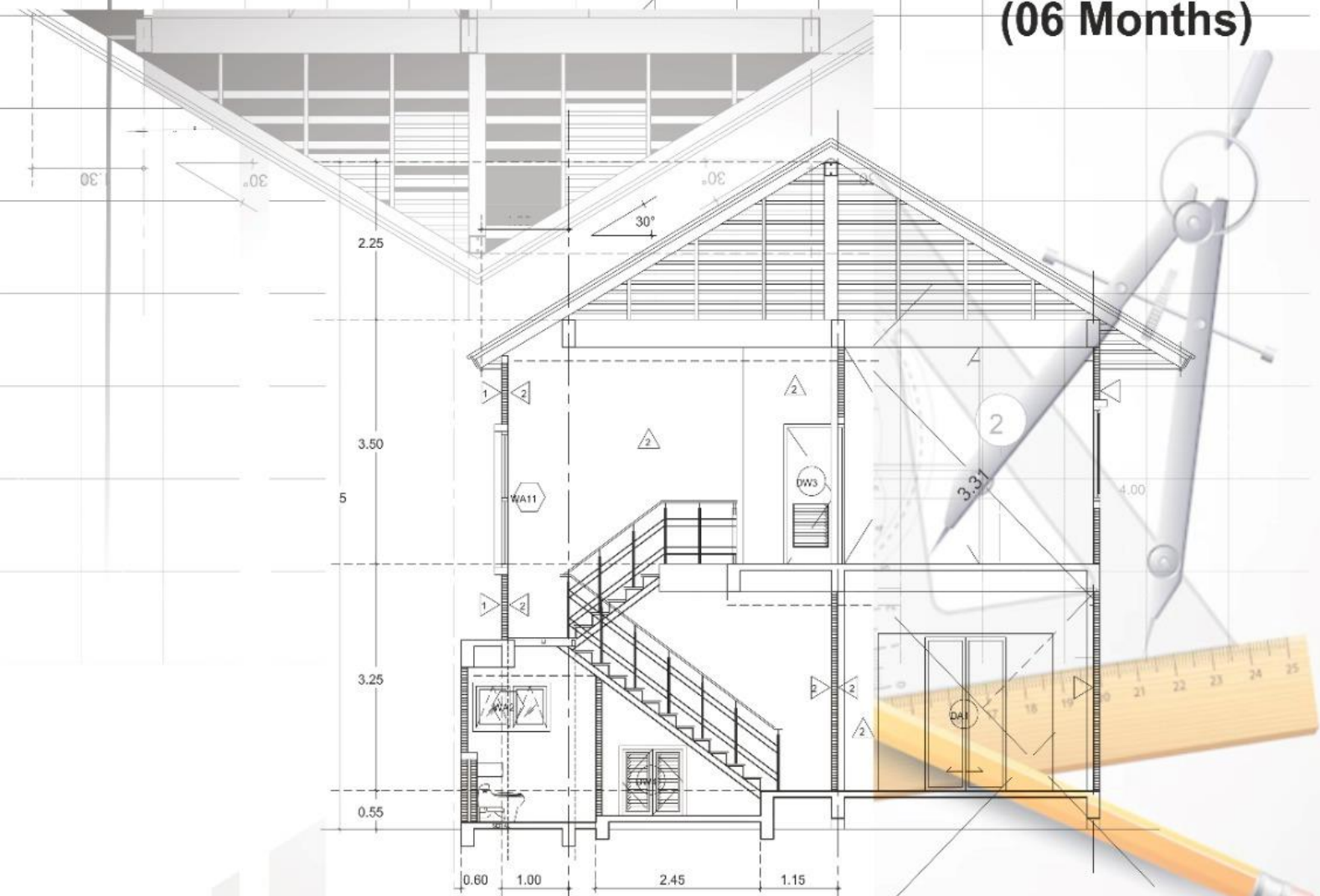




Architectural Drafting LEVEL 2

Teacher Learning Material
National Vocational Certificate Level-2
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INTRODUCTION

Architectural drafting is a critical skill used by architects, draftsmen, and design professionals to create precise construction drawings, floor plans, and structural layouts. This discipline extends beyond architecture, playing a key role in engineering, interior design, and product development through detailed 2D and 3D representations.

To standardize expertise in this field, the National Vocational & Technical Training Commission (NAVTTTC) has introduced the "National Vocational Certificate Level-2 in Information Technology (Architectural Drafting)." Developed in consultation with industry leaders and employers, this qualification ensures alignment with current sector demands and professional drafting standards.

Based on national competency guidelines, this Teaching and Learning Material (TLM) is structured into following key topics to develop essential architectural drafting skills:

- Fundamentals of Basic Architectural Drafting
- Technical Drawing & 2D Modeling Techniques
- Real-World Applications and Project-Based Practice
- Designed to bridge theory and practice, this material equips learners with the necessary skills to excel in architectural drafting and related technical professions.

Module 1: Follow Safety Rules at Workplace

Module 2: Demonstrate Basic Numeracy Skills

Module 3: Perform Basic Manual Drawing

Module 4: Perform Basic Computer Operations

Module 5: Develop 2D Drawings in 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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Learning Outcomes:

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

- Maintain Occupational Safety, Health and Green Environment at Workplace
- Use Personal Protective and Safety Equipment (PPEs)

Learning Unit 1.1**Maintain Occupational Safety, Health and Green Environment at Workplace****Learning Outcomes:**

After completion of this Learning Unit, trainee will be able to:

- Assess the situation.
- Select equipment as per task
- Verify the working condition.
- Identify basic elements for first aid kit
- Maintain a fully stocked first aid kit
- Check expiry date of medicines
- Recycle waste material

1.1.1 Types of Hazards**Physical Hazards**

- Things like loud noise, radiation, very hot or cold temperatures, or dangerous machines that can hurt you.

Chemical Hazards

- Harmful chemicals such as gases, fumes, or toxic substances that can make you sick.

Biological Hazards

- Germs like bacteria, viruses, or fungi that can cause infections or diseases.

Ergonomic Hazards

- Poor posture, repetitive actions, or lifting things the wrong way that can lead to pain or injury.

Psychosocial Hazards

- Things like stress, bullying, harassment, or too much work that can affect your mental health.

Mechanical Hazards

- Problems with machines or tools that can cause accidents or injuries.

Remember

About 30% of workplace injuries are muscle and bone problems (MSDs), which are caused by things like repeating the same movements or sitting/standing in uncomfortable positions.



Biological Hazards



Chemical Hazards



Physical Hazards



Safety Hazards



Ergonomic Hazards



Psychosocial Hazards

1.1.2 Unsafe Working Conditions

- **Poor Lighting:** Not enough light can hurt your eyes or cause accidents.
- **Cluttered Workspaces:** Makes it difficult to move around and increases the risk of tripping or falling.
- **Inadequate Ventilation:** Can lead to the build-up of harmful gases or dust.
- **Improper Use of Equipment:** Using machinery without proper training or safety measures.

- **Lack of Personal Protective Equipment (PPE):** Failing to use appropriate safety gear like helmets, gloves, or goggles.

1.1.3 Knowledge of Housekeeping

- **Cleanliness:** Keep work areas tidy to avoid accidents and improve efficiency.
- **Proper Waste Disposal:** Ensure that waste is disposed of in a safe and appropriate manner.
- **Organized Equipment:** Tools and equipment should be stored properly to avoid accidents.
- **Slips, Trips, and Falls Prevention:** Clean up spills immediately and keep walkways clear of obstructions.
- **Regular Inspections:** Regularly check for hazards, like frayed cords, loose flooring, or faulty equipment.



1.1.4 Methods of Dealing with Hazards

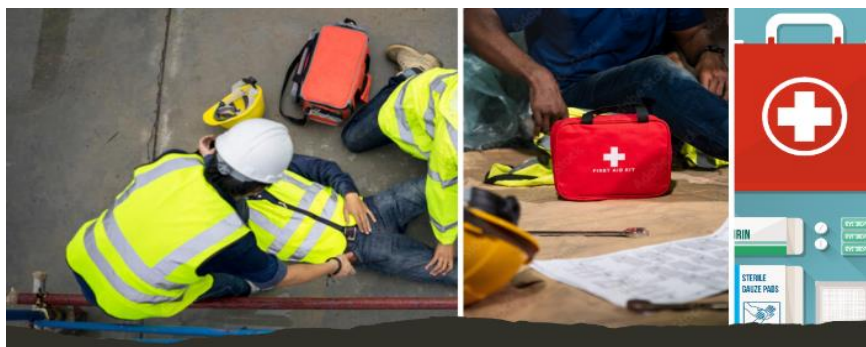
- **Risk Assessment:** Identify potential hazards and evaluate their risk to safety.
- **Implementing Safety Measures:** Use PPE, guard machinery, and implement emergency procedures.
- **Training and Awareness:** Provide safety training to employees to make them aware of potential risks and safe practices.
- **Safety Inspections:** Regularly check for new or emerging hazards.
- **Emergency Protocols:** Establish procedures for handling accidents or emergencies (e.g., fire drills, evacuation plans).

1.1.5 Factors Affecting Health & Safety in the Workplace

- **Workplace Culture:** A positive culture where safety is prioritized promotes a safer environment.
- **Management Commitment:** Support from leadership is crucial for effective health and safety programs.
- **Employee Engagement:** Involving employees in safety training and discussions can lead to better safety outcomes.
- **Workload:** Overwork can lead to fatigue, stress, and accidents.
- **Work Environment:** Adequate lighting, ventilation, temperature control, and clean workspaces all affect safety.

1.1.6 Introduction to First-Aid

- **Basic First-Aid Skills:** Learn how to provide basic first-aid in case of accidents, such as cleaning wounds, applying bandages, or performing CPR.
- **First-Aid Kit:** Make sure to have a well-stocked first-aid kit available at the workplace.



Emergency Medicines and Expiry

- **Check Expiry Dates:** Regularly check all emergency medicines and replace any expired items.
- **Common Medicines in First-Aid Kits:** These may include painkillers, antiseptic creams, burn ointments, bandages, gauze, and more.

Methods of Treatment Against Electric Shock

- **Stop the Current:** If safe, turn off the power supply. Do not touch the person with your bare hands if the electricity is still on.
- **Call for Help:** Call emergency services immediately.
- **CPR (Cardiopulmonary Resuscitation):** If the person is not breathing or has no pulse, administer CPR.
- **Monitor the Victim:** After the shock, keep the person lying down, keep them warm, and avoid any movement until medical help arrives.

Methods of Treatment against Minor Injuries

- **Cuts and Scrapes:** Clean the wound with water and apply a sterile bandage.
- **Burns:** Cool the burn under running cold water for 10-20 minutes, and cover it with a clean bandage.
- **Sprains and Strains:** Rest, ice, compression, and elevation (R.I.C.E) method.
- **Bruises:** Apply ice to reduce swelling and pain.

1.1.7 Importance of Adopting Green Skills

Green skills are the knowledge, abilities, and values that help us live and work in ways that protect the environment and use resources wisely. These skills are essential for building a more sustainable and efficient future.

- **Sustainability:** Green skills help reduce damage to the environment and support long-term, eco-friendly development.
- **Energy Efficiency:** They promote smart use of energy, which lowers electricity costs and reduces harm to the planet.
- **Waste Reduction:** Proper waste management and recycling help decrease pollution and reduce the amount of trash going to landfills.
- **Healthier Environment:** Using fewer toxic materials and keeping workplaces clean leads to better health and safety for everyone.
- **Innovation:** Green skills inspire creative and eco-friendly ways of working, designing, and producing goods.

Remember

The green economy is creating millions of jobs worldwide. The International Labor Organization (ILO) estimates that moving towards greener economies can create up to 60 million jobs globally by 2030.



Activity 1:

Identify the physical hazards in mock situation and apply control measures

Step 1: Identifying Hazards

- Ergonomics:** Poor desk/chair setup, bad posture.
- Electrical:** Exposed cords, faulty equipment.
- Slips/Trips/Falls:** Cords in walkways, wet floors.

- iv. **Lighting:** Glare or insufficient light.
- v. **Clutter:** Messy workspace, obstructed paths.
- vi. **Air Quality:** Poor ventilation or overheating.

Step 2: Control Measures

- i. **Ergonomics:** Adjust desk/chair, screen height.
- ii. **Electrical Safety:** Secure cords, avoid overloading outlets.
- iii. **Prevent Fall:** Clear walkways, clean spills.
- iv. **Lighting:** Adjust lighting, reduce glare.
- v. **Declutter:** Organize workspace.
- vi. **Air Quality:** Improve ventilation.

Learning Unit 1.2	Use Personal Protective and Safety Equipment (PPEs)
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Learning Outcomes:

After completion of this Learning Unit, trainee will be able to:

- Arrange the required personal protective equipment
- Check functional condition of PPE's
- Wear / use personal protective equipment
- Store PPE at appropriate place after use.
- Clean / care required personal protective equipment
- Operate PPEs
- Check expiry of PPEs

1.2.1 Types of PPE

- **Head:** Hard hats.
- **Eyes/Face:** Safety goggles.
- **Ears:** Earplugs, earmuffs.
- **Hands:** Gloves.
- **Feet:** Steel-toe boots.
- **Respiratory:** Masks.
- **Body:** High-visibility vests.

1.2.2 Importance of PPE

- **Prevents injuries** and complies with safety rules.
- **Promotes a safe environment** and reduces accidents.

1.2.3 Uses of PPE

- **Protects** from physical, chemical, and environmental hazards in construction or design work.

1.2.4 Safety Measures

- **Training** on proper use.
- **Inspect PPE** for damage before use.
- **Always wear PPE** in hazardous areas.

1.2.5 Types of Work Site Hazards

- **Physical:** Tools, machinery.
- **Chemical:** Paints, solvents.
- **Mechanical:** Equipment injuries.
- **Ergonomic:** Repetitive strain.
- **Environmental:** Dust, heat.

1.2.6 Risk Management

- **Identify & assess hazards.**
- **Use PPE** and safety measures.

Activity-1:

Regularly check safety practices.

Activity-2:

Demonstrate to Select PPEs for Specific Job

Step 1: Identify Hazards:

Look for risks such as flying debris, chemicals, sharp objects, loud noise, or dust.

Step 2: Choose the Right PPE:

- **Head Protection:** Wear a hard hat if there's a risk of falling objects.
- **Eye Protection:** Use safety glasses or goggles for flying particles.
- **Hand Protection:** Wear gloves to protect from cuts, chemicals, or heat.
- **Foot Protection:** Choose steel-toed shoes for protection from heavy objects.
- **Hearing Protection:** Use earplugs or earmuffs in loud environments.
- **Respiratory Protection:** Wear a mask for dust or fumes.

Step 3: Wear PPE Correctly:

Ensure PPE fits well and is worn properly for maximum safety.

Step 4: Maintain PPE:

Clean PPE regularly and replace any damaged items.

SUMMARY

Workplace safety means identifying and managing hazards such as physical, chemical, and ergonomic risks. It also involves maintaining safe working conditions through good housekeeping, using safety measures, and wearing protective gear. Knowing basic first aid—like how to handle electric shocks and minor injuries is essential during emergencies, along with regularly checking the expiry dates of emergency medicines.

Adopting green skills, such as saving energy and reducing waste, not only protects the environment but also helps create a healthier, safer, and more sustainable workplace for everyone.

FAQs:

Q1. What is a hazard?

Ans. A hazard is anything that can cause harm or injury in the workplace.

Q2. What are unsafe working conditions?

Ans. Unsafe working conditions are environments that increase the risk of accidents or injuries.

Q3. Why is housekeeping important at work?

Ans. Good housekeeping helps prevent accidents and maintains a clean, safe workspace.

Q4. How can hazards be controlled in the workplace?

Ans. Hazards can be controlled by eliminating, substituting, engineering controls, administrative controls, or using PPE.

Q5. What is first aid?

Ans. First aid is the immediate help given to an injured or ill person before professional medical help arrives.

Q6. What should you do in case of an electric shock?

Ans. Turn off the power, and then call for help and perform CPR if needed.

Q7. What is PPE?

Ans. PPE (Personal Protective Equipment) includes safety gear like gloves, goggles, and helmets to protect against workplace hazards.

Q8. Why is PPE important?

Ans. PPE helps reduce the risk of injury and protects workers from harm.

Q9. What are work site hazards?

Ans. Work site hazards are dangers that can cause injury or illness, such as chemicals, machinery, or poor conditions.

Q10. What is risk management?

Ans. Risk management involves identifying, assessing, and controlling hazards to reduce accidents and injuries.

MCQS

- 1. What is the purpose of using PPE in the workplace?**
 - a. To enhance comfort
 - b. To prevent injuries and accidents
 - c. To comply with dress codes
 - d. To look professional
- 2. Which of the following is a physical hazard?**
 - a. Exposure to noise
 - b. Exposure to toxic fumes
 - c. Poor workstation setup
 - d. Workplace bullying
- 3. What should be the first step in dealing with a workplace hazard?**
 - a. Ignore it
 - b. Conduct a risk assessment
 - c. Implement safety measures
 - d. Report it to management
- 4. What is the effect of poor lighting in the workplace?**
 - a. It increases productivity
 - b. It causes eye strain and accidents
 - c. It promotes better focus
 - d. It helps workers relax
- 5. What should be done if there is a cluttered workspace?**
 - a. Leave it as is
 - b. Organize and declutter
 - c. Move it to another area
 - d. Ignore it
- 6. What is the goal of green practices in the workplace?**
 - a. To reduce environmental impact
 - b. To increase energy consumption
 - c. To promote luxury
 - d. To reduce employee productivity
- 7. How should a minor burn be treated?**
 - a. Apply ice directly to the burn
 - b. Cool under running water for 10-20 minutes
 - c. Cover it with ointment immediately
 - d. Apply heat to the burn
- 8. Which PPE protects the eyes?**
 - a. Gloves
 - b. Safety Goggles
 - c. Ear plugs
 - d. Hard hats
- 9. How can electrical hazards be avoided in the workplace?**
 - a. Ignore exposed wires
 - b. Secure cords and avoid overloading outlets
 - c. Use wet hands to handle wires
 - d. Leave electrical equipment unattended
- 10. What should be done after using PPE?**
 - a. Leave it where you last used it
 - b. Clean and store it properly
 - c. Hand it to a colleague
 - d. Discard it immediately

Answer Key

1.	b	2.	b	3.	b	4.	c
5.	a	6.	a	7.	c	8.	b
9.	b	10.	b	11.	c	12.	b
13.	a	14.	c	15.	a	16.	b
17.	a	18.	b	19.	b	20.	d
21.	b	22.	d	23.	c	24.	b
25.	a						

Learning Outcomes:

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

- Apply Basic Numeracy Skills
- Perform Measurement
- Calculate Area and Volume

Learning Unit 2.1**Apply Basic Numeracy Skills****Learning Outcomes:**

After completion of this Learning Unit, trainee will be able to:

- Perform addition
- Perform subtraction
- Perform multiplication
- Perform division
- Calculate percentage

2.1.1 Basic Principles of Numeracy

Numeracy skills are the ability to use numbers and math in everyday life. They are essential for problem-solving, making decisions, and managing tasks at work and home. Here are the basic principles:

1. Understanding Numbers

Knowing how to recognize, read, and work with numbers is the foundation of numeracy. This includes counting, ordering, and comparing numbers.

2. Basic Operations

Learning the four basic operations – addition, subtraction, multiplication, and division – is key for solving everyday problems.

3. Measurement

Understanding units of measurement (like time, length, weight, and volume) helps with tasks such as cooking, budgeting, or planning a project.

4. Problem Solving

Using numbers to solve real-life problems, like calculating discounts, figuring out expenses, or estimating time.

5. Data Interpretation

Being able to read and understand graphs, charts, and tables helps you make informed decisions based on data.

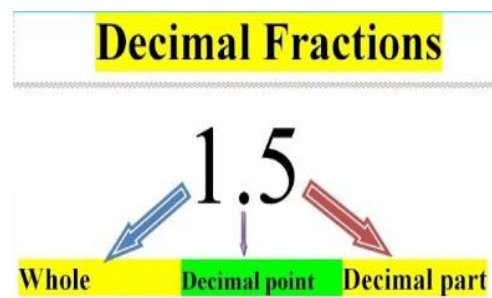
6. Estimation

Knowing how to make quick, rough calculations or guesses is useful when you need to make decisions without exact numbers.

2.1.2 Concept of Fractions & Decimals

In AutoCAD, you'll often need to switch between fractions and decimals, especially when setting dimensions or scaling.

- Fractions: A fraction is a part of a whole, represented as a numerator (top number) and a denominator (bottom number).
- Example: $\frac{1}{2}$, $\frac{3}{4}$, $\frac{5}{8}$.
- Decimals: A decimal is another way to represent fractions, often used in AutoCAD for more precise measurements.
- Example: 0.5 (equivalent to $\frac{1}{2}$), 0.75 (equivalent to $\frac{3}{4}$), 0.625 (equivalent to $\frac{5}{8}$).

**Activity 1:**

Practice basic arithmetic and the conversion between fractions and decimals. This helps with accuracy in drawing, scaling, and dimensioning.

Addition

Example: Add 5.75 + 2.25.
 Solution: $5.75 + 2.25 = 8.00$

Subtraction

Example: Subtract 4.6 from 10.
 Solution: $10 - 4.6 = 5.4$

Multiplication

Example: Multiply 3.5 by 4.
 Solution: $3.5 \times 4 = 14$

Division

Example: Divide 14 by 3.
 Solution: $14 \div 3 = 4.6667$ (or $4 \frac{2}{3}$)

Percentage

Example: What is 15% of 200?

Solution: $0.15 \times 200 = 30$

Converting Fractions to Decimals and Vice Versa

$\frac{1}{2} = 0.5$

$\frac{3}{4} = 0.75$

$\frac{5}{8} = 0.625$

To convert a fraction to a decimal, divide the numerator by the denominator.

Learning Unit 2.2**Perform Measurement****Learning Outcomes:**

After completion of this Learning unit trainee will be able to:

- Select measuring tools as per requirement
- Identify imperial and metric system
- Perform inter conversion of Measuring units.

2.2.1 Measuring Tools

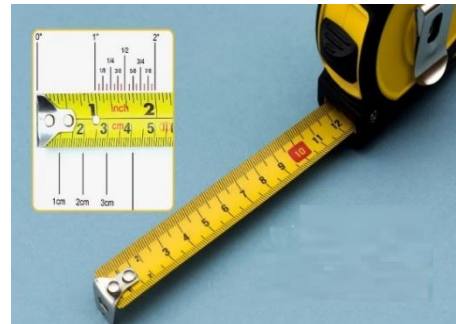
These tools are commonly used for measuring dimensions in various fields such as engineering, construction, woodworking, and manufacturing. Here's an explanation of each:

Measuring Tape

A flexible ruler made of cloth, plastic, fiberglass, or metal strip with linear measurement markings. It is typically housed in a compact case and can be extended for measuring longer distances.

Use: Ideal for measuring lengths, widths, and heights, especially in construction.

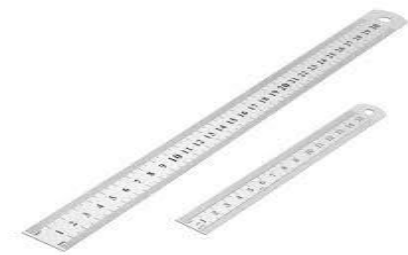
Key Features: Retractable, marked in inches and centimeters, and available in various lengths (e.g., 10 ft, 25 ft, 100 ft).

**Steel Ruler/Scale**

A rigid, straight-edged ruler made of steel, marked with precise measurement units (millimeters, centimeters, inches).

Use: Used for measuring shorter lengths and drawing straight lines. It is commonly used in drafting, machining, and woodworking.

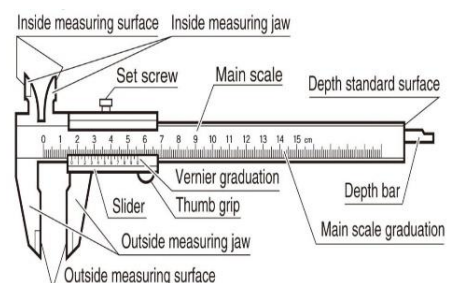
Key Features: Durable, corrosion-resistant, and provides high accuracy for small measurements.

**Vernier Caliper**

A precision measuring tool with a sliding scale (vernier scale) that allows for highly accurate measurements. It consists of two jaws (internal and external) and a depth probe.

Use: Measures internal and external dimensions (e.g., diameter, thickness) and depths with high precision. Commonly used in engineering, machining, and scientific applications.

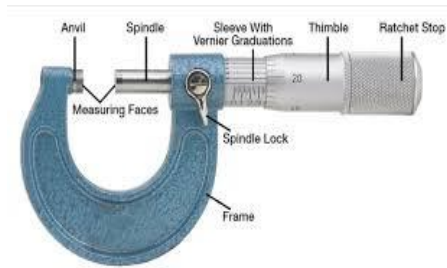
Key Features: Can measure to within 0.02 mm or 0.001 inches, available in digital, dial, and traditional Vernier scales.

**Micrometer**

A precision instrument used to measure very small dimensions with extremely high accuracy. It consists of a calibrated screw and a thimble scale.

Use: Measures thickness, diameter, or depth of small objects, such as wires, sheets, or machined parts. Widely used in mechanical engineering and manufacturing.

Key Features: Can measure to within 0.01 mm or 0.0001 inches, available in digital and analog versions



2.2.2 Imperial and Metric Systems of Measurements

Measurements are typically taken in either the Imperial System (inches and feet) or the Metric System (millimeters, centimeters and meters). Understanding both systems is essential for cross-disciplinary work.

Imperial System:

- Inches ("): A small unit of length. There are 12 inches in 1 foot.
- Feet ('): A unit of length equal to 12 inches. Often used in construction and architectural drawings.

Metric System:

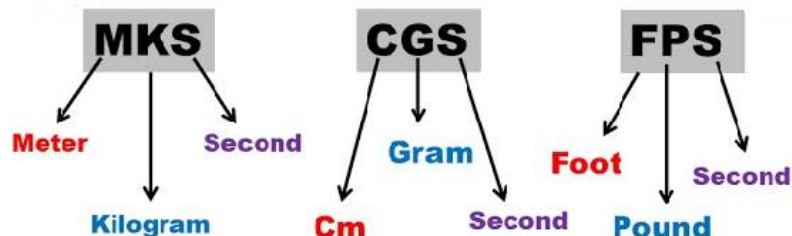
- Millimeters (mm): The smallest unit of length in the metric system, commonly used for precision in design.
- Centimeters (cm): 1 cm = 10 mm. Often used for smaller designs and interior layouts.
- Meters (m): The standard unit of length in the metric system, used for larger-scale designs.

Key Conversion:

- 1 inch = 25.4 mm
- 1 foot = 0.3048 meters
- 1 meter = 1000 mm
- 1 foot = 12 inches

2.2.3 Basic Measuring Units (MKS, FPS, CGS, SI)

The system of measurements used in AutoCAD can be based on various unit systems. Here's a breakdown of the most common systems:



MKS (Meter-Kilogram-Second):

This is the International System (SI) of units used globally.

- Unit of Length: Meter (m)
- Unit of Mass: Kilogram (kg)
- Unit of Time: Second (s)

FPS (Foot-Pound-Second):

This system is commonly used in the United States, particularly in construction and engineering.

- Unit of Length: Foot (ft)
- Unit of Mass: Pound (lb)
- Unit of Time: Second (s)

CGS (Centimeter-Gram-Second):

A smaller unit system often used in scientific contexts.

- Unit of Length: Centimeter (cm)
- Unit of Mass: Gram (g)
- Unit of Time: Second (s)

SI (International System of Units):

The most widely used unit system for scientific and technical measurements.

- Unit of Length: Meter (m)
- Unit of Mass: Kilogram (kg)
- Unit of Time: Second (s)

Inter-Conversion of Units

In AutoCAD, you may need to convert between different units, especially when working with projects that require multiple measurement systems. Here are some essential conversions:

Inches to Millimeters:

1 inch = 25.4 mm

Feet to Meters:

1 foot = 0.3048 meters

Centimeters to Meters:

1 cm = 0.01 meters

Millimeters to Centimeters:

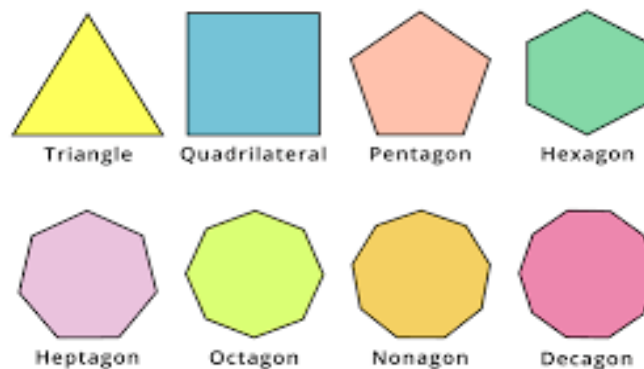
10 mm = 1 cm

To convert between other units (such as from meters to feet or kilograms to pounds), you can use the **Convert** function or manually calculate using the conversion factors above.

Activity 1:

Taking measurements of different geometrical figures using a scale is a basic skill that involves using a ruler or measuring tape to measure the length, width, height, radius, or other necessary dimensions of the shape.

- Choose a Shape: Select shapes like squares, rectangles, triangles, and circles.
- Use a Scale: Measure the dimensions of each shape (length, width, height, radius, etc.).
- Record Measurements: Ensure you use accurate measurement tools (ruler, scale, and caliper if needed).



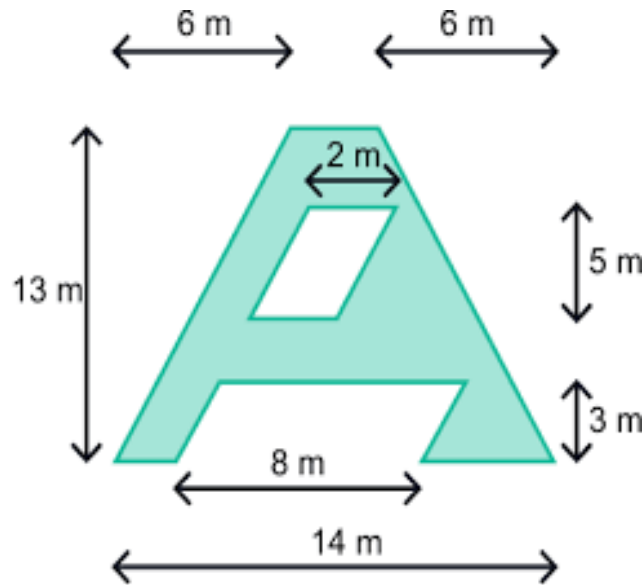
Activity 2:

Measure the Boundaries of Specific Land and Calculate its Area and Perimeter



Activity 3:

Take measurement of different solids



Activity 4:

Practice converting between units to ensure accurate scaling and dimensioning.

Convert Between Different Units:

- Convert inches to millimeters (e.g., 10 inches = 254 mm).
- Convert feet to meters (e.g., 5 feet = 1.524 meters).

Use Conversion Formulae:

- Practice converting both larger and smaller units using appropriate conversion factors.

Example: Convert 15 feet to inches, and 200 millimeters to centimeters.

Real-World Application:

- Convert units for different measurement needs, ensuring your AutoCAD drawings match real-world dimensions.

Learning Unit 2.3

Calculate Area and Volume

Learning Outcomes:

After completion of this Learning unit trainee will be able to:

- Calculate area of geometrical figures
- Calculate volume of solid figures
- Calculate perimeters
- Calculate average

2.3.1 Standard Units for Area, Perimeter and Volume

Area:

The area is a measure of the size of a surface or a region in two-dimensional space. It is typically expressed in square units (e.g., square meters, square feet). In simpler terms, area tells you how much space a shape or surface occupies.

The formula for calculating area varies depending on the shape:

- **Rectangle:** $\text{Area} = \text{length} \times \text{width}$
- **Circle:** $\text{Area} = \pi \times r^2$ (where r is the radius)
- **Triangle:** $\text{Area} = \frac{1}{2} \times \text{base} \times \text{height}$
- **Square:** $\text{Area} = \text{side}^2$

Each shape has a specific formula depending on its geometry.

Perimeter:

The **perimeter** of a shape is the total distance around the boundary of that shape. It is calculated by adding up the lengths of all the sides of the shape. The perimeter is usually measured in linear units like meters, centimeters, or inches.

For example:

- For a rectangle, the perimeter is $P=2 \times (\text{length} + \text{width})$ $P = 2 \times (\text{length} + \text{width})$
- For a square, the perimeter is $P=4 \times \text{side length}$ $P = 4 \times \text{side length}$
- For a circle, the perimeter is called the **circumference**, and the formula is $C=2 \times \pi \times \text{radius}$ $C = 2 \times \pi \times \text{radius}$

Would you like to know how to calculate the perimeter of a specific shape?

Volume:

Volume is the amount of space occupied by a three-dimensional object or substance. It is measured in cubic units, such as cubic meters (m^3), cubic centimeters (cm^3), or liters (L).

The formula to calculate the volume depends on the shape of the object:

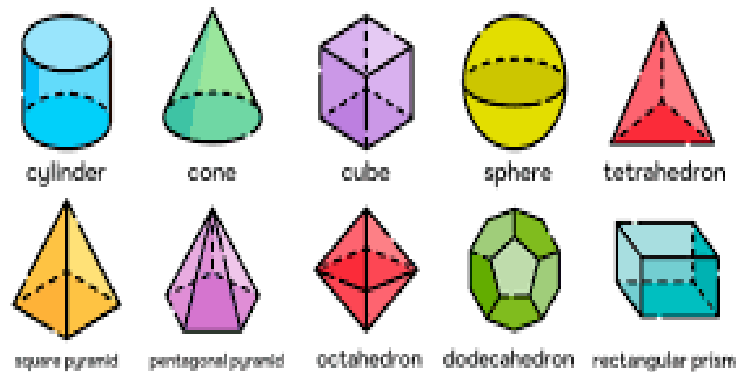
- **Cube:** $V=\text{side}^3$ $V = \text{side}^3$
- **Rectangular prism (box):** $V=\text{length} \times \text{width} \times \text{height}$ $V = \text{length} \times \text{width} \times \text{height}$
- **Cylinder:** $V=\pi \times r^2 \times h$ $V = \pi \times r^2 \times h$ (where r is the radius of the base and h is the height)
- **Sphere:** $V=\frac{4}{3} \times \pi \times r^3$ $V = \frac{4}{3} \times \pi \times r^3$ (where r is the radius)
- **Cone:** $V=\frac{1}{3} \times \pi \times r^2 \times h$ $V = \frac{1}{3} \times \pi \times r^2 \times h$

These formulas allow you to find the volume of various objects. Would you like to calculate the volume of a specific shape?

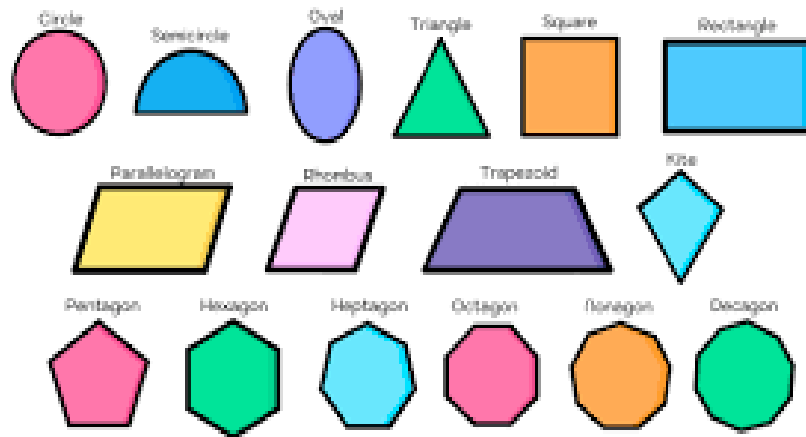
2.3.2 Geometrical Figures

Geometric figures are shapes created using points, lines, or planes. They can be classified as:

Space figures: Three-dimensional shapes.



Plane figures: Two-dimensional shapes.



Geometric shapes include **circle, rectangle, triangle, square, and cone.**

2.3.3 Area Calculation

Here is the list of differences between area and perimeter:

Area	Perimeter
Area is the region occupied by a shape	Perimeter is total distance covered by the boundary of a shape
Area is measured in square units (m ² , cm ² , in ² , etc.)	Perimeter is measured in units (m, cm, in, feet, etc.)
Example: Area of rectangular ground is equal to product of its length and breadth.	Example: Perimeter of a rectangular ground is equal to sum of all its four boundaries, i.e., 2(length + breadth).

Area and Perimeter For all Shapes

There are many types of shapes. The most common ones are Square, Triangle, Rectangle, Circle etc. To know the area and perimeter of all these, we need different formulas.

Perimeter and Area of a Rectangle

A rectangle is a figure/shape with opposite sides equal and all angles equal to 90 degrees. The area of the rectangle is the space covered by it in an XY plane.



- Perimeter of a Rectangle = $2(a+b)$
- Area of Rectangle = $a \times b$

Where a and b are the length and width of the rectangle.

Perimeter and Area of a Square

A Square is a figure/shape with all four sides equal and all angles equal to 90 degrees. The area of the square is the space occupied by the square in a 2D plane and its perimeter is the distance covered on the outer line.



- Perimeter of a Square = $4a$
- Area of a Square = a^2

Where a is the length of the side of the square.

Perimeter and Area of Triangle

The triangle has three sides. Therefore, the perimeter of any given triangle, whether it is scalene, isosceles or equilateral, will be equal to the sum of the length of all three sides. And the area of any triangle is the space occupied by it in a plane.

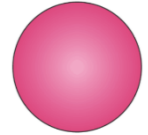


- Perimeter of a triangle = $a + b + c$, where a, b and c are the three different sides of the triangle.
- Area of a triangle = $\frac{1}{2} b \times h$; where b is the base and h is the height of the triangle.

Area and Circumference of Circle

Area of a circle is the region occupied by it in a plane.

In case of a circle, the distance of the outer line of the circle is called the circumference.



- Circumference of Circle = $2\pi r$
- Area of Circle = πr^2

2.3.4 Volume Calculation

Volume is the space taken up by a solid shape. For example, a compass box has more volume than an eraser inside it.

To find the area of flat shapes, we use squares. To find the volume of solid shapes, we use cubes.

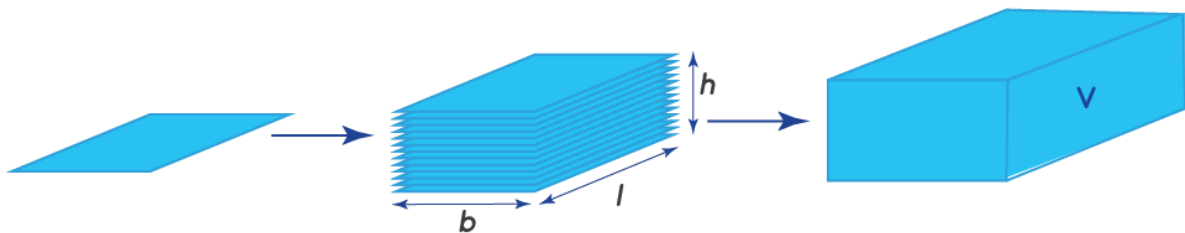
Next, we will learn how to find the volume of different solid shapes easily.

Volume of 3D-Shapes

Every object in our surroundings has a nature of occupying space. These real-life objects can be easily compared with the basic 3-D shapes. Let us have a look at the volume of these solid shapes in detail.

Volume of a Cuboid

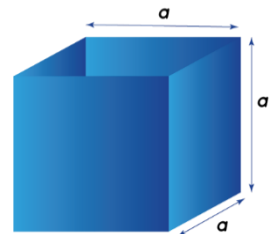
Suppose we have some rectangular sheets with length 'l' and width 'b'. If we stack them one on top of the other up to height 'h', we get a cuboid of dimensions l, b, h. This can be seen in the following figure which shows the length, width (breadth), and height of the cuboid thus formed.



To calculate the amount of space enclosed by this cuboid, we use the formula: Volume of a Cuboid = $l \times b \times h$

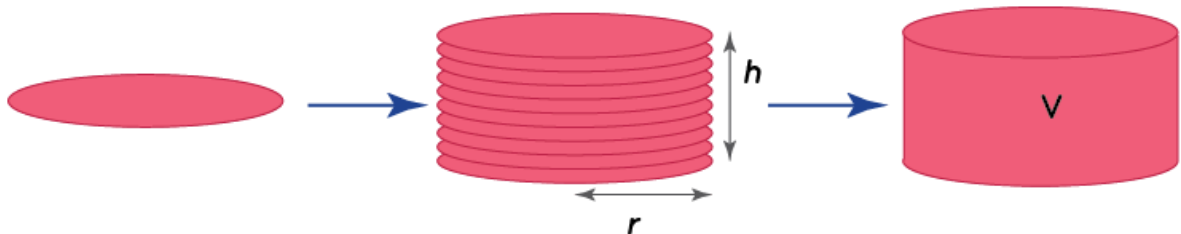
Volume of a Cube

A cube is a special case of a cuboid where all three sides are equal in measure. If we represent this equal value as 'a', then the volume of this cube can then be calculated with the formula: Volume of a Cube = $a \times a \times a = a^3$. Observe the following figure to see the equal sides of a cube and the space it occupies.



Volume of a Cylinder

Just as we built up a cuboid using rectangles, we can build a cylinder using circles of the same size.



A cylinder is a tube-like structure with two parallel circular bases which are joined by a curved surface at a fixed distance from the center. The distance between these two bases is the height of the cylinder. If we consider 'r' as the radius of the circular base (and top) and 'h' as the height of the cylinder, then the volume of the cylinder can be expressed as Volume of a Cylinder = $\pi r^2 h$

Volume of a Pyramid

Pyramids have a polygon as their base and triangular faces that meet at the apex. The volume of a pyramid is calculated with the help of the formula: Volume of a Pyramid = $\frac{1}{3} \times \text{Base length} \times \text{Base width} \times \text{height of the pyramid}$. This formula can also be written as $\frac{1}{3} \times \text{Base area of the polygon} \times \text{height of the pyramid}$.

Volume of Cone

The difference between a cone and a pyramid is that the base of a cone is circular whereas the base of a pyramid is a polygon. The volume of a cone is calculated with the formula: $\frac{1}{3} \times \pi r^2 h$.

Volume of Sphere

The volume of a sphere is the space occupied by it.

The volume of a sphere whose radius r is $\frac{4}{3} \pi r^3$.

Now that we are familiar with the formulas of various geometric shapes, let's take a look at the different units of volume.

How to Calculate the Volume?

Here are the steps to calculate volume of any solid shape:

- Identify all the given parameters that are useful and are required to substitute in the respective volume formula. Such as the radius to be 'r' and height to be 'h', the slant height, diameter, etc.
- Make sure all the parameters are of the same units.
- Substitute the values in the volume formula of the respective shapes.
- Write the units as cubic units.

Let us understand the steps with help of an example.

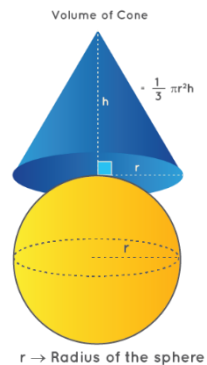
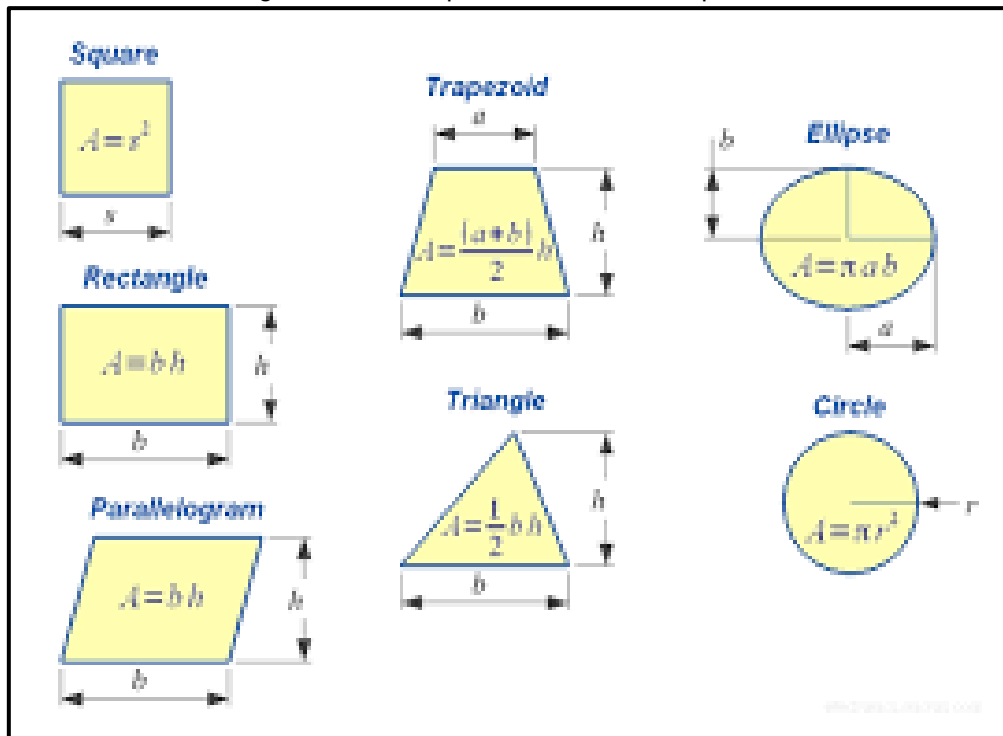
Example: Find the volume of a right circular cylinder of radius 25 m and height 1 meter. Use $\pi = 3.142$.

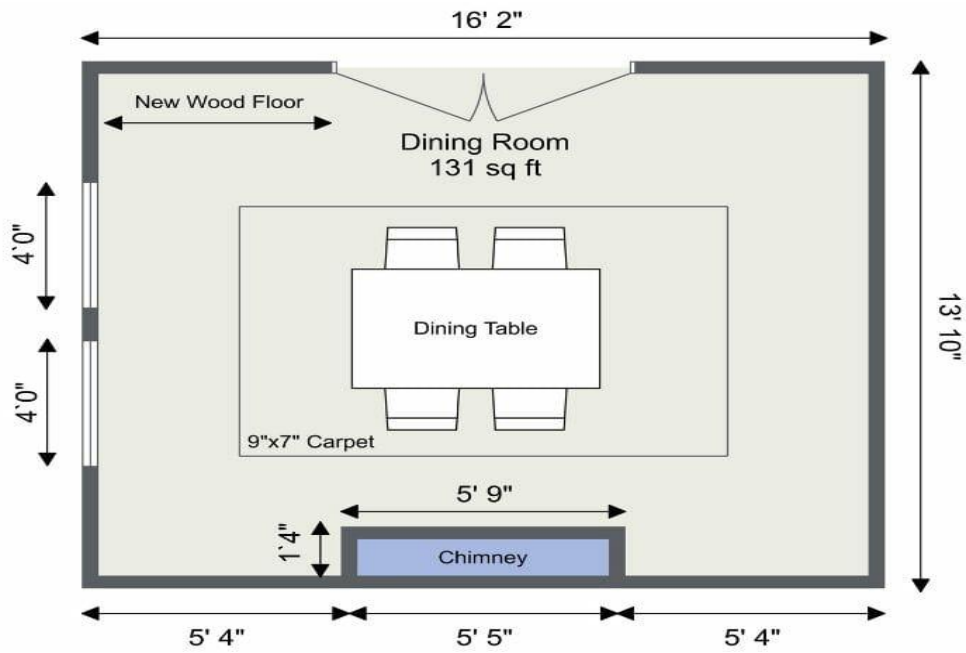
Solution:

- The radius of the cylinder is, $r = 25$ m.
- Its height is $h = 1$ meter.
- Its volume of cylinder is, $V = \pi r^2 h = (3.142) (25)^2 (1) = 1963.75 \text{ m}^3$.
- The volume of a cylinder is 1963.75 cubic meters.

Activity 1:

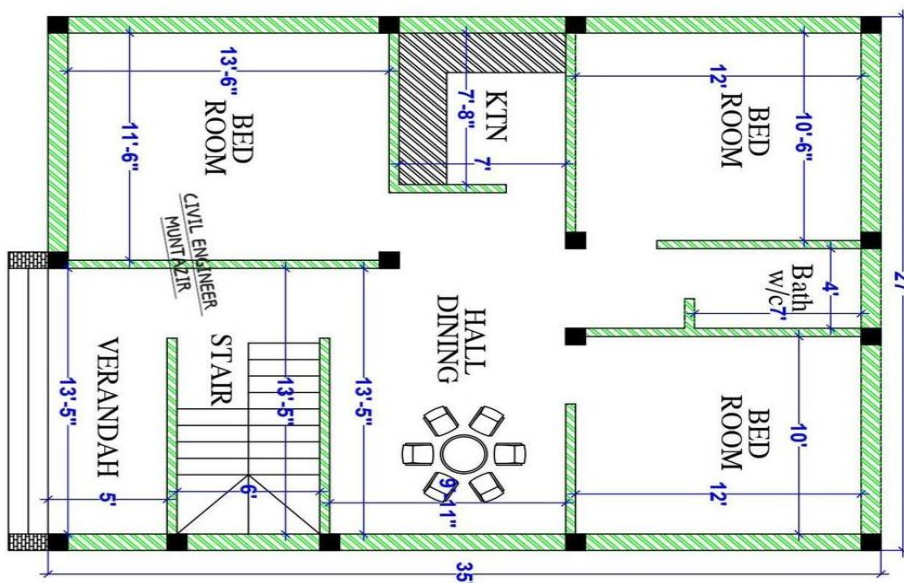
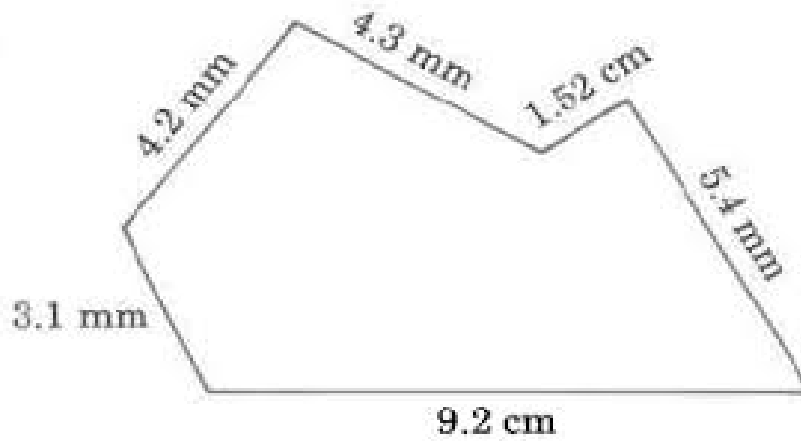
Practice to calculate areas of geometrical shapes as well as house plans.





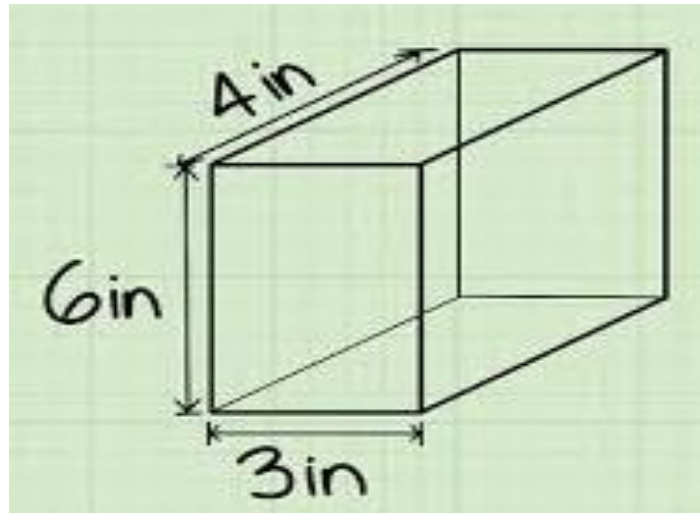
Activity 2:

Practice to calculate perimeter of different geometrical shapes and house plans.

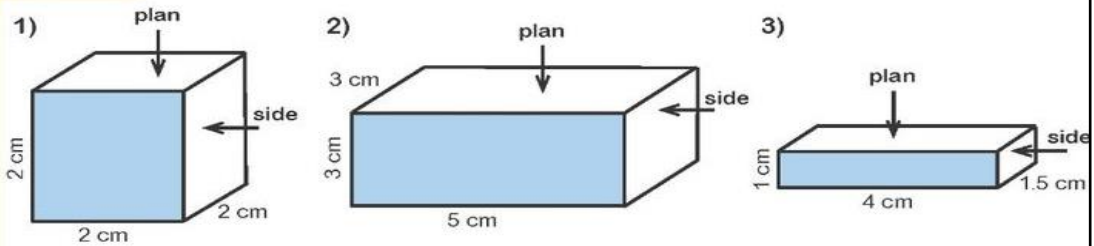


Activity 3:

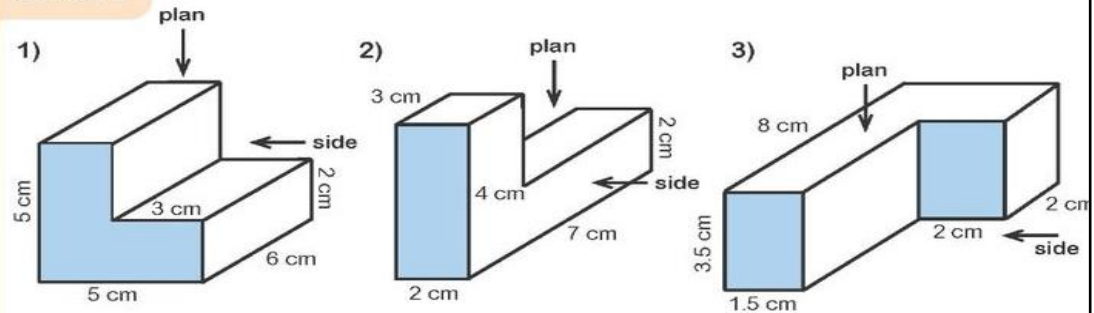
Practice to calculate volume of 3D shapes.



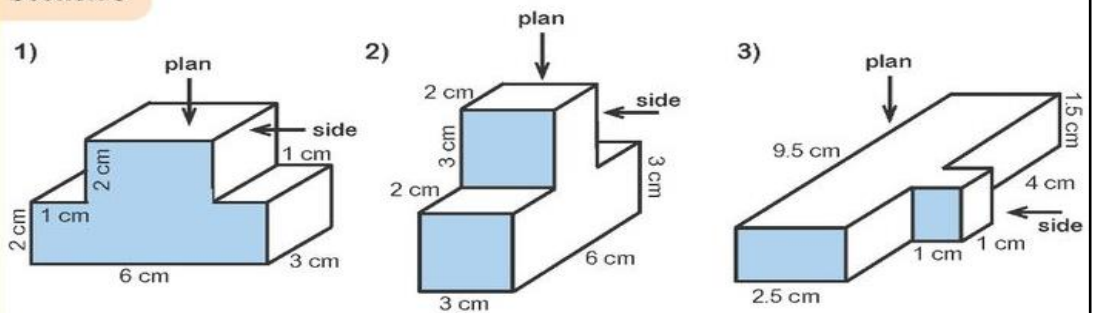
Section A



Section B



Section C



SUMMARY

Demonstrating basic numeracy skills involves applying essential math concepts like fractions, decimals, arithmetic, and scaling factors to perform tasks accurately. These skills are crucial for precise measurements, calculations, and effective design work. A solid understanding of different measurement systems (Imperial and Metric) and units (MKS, FPS, CGS, SI) is key to ensuring accuracy and consistency. Additionally, the ability to convert between units allows for seamless work across various systems. Mastering these skills enhances efficiency and precision, especially in design software like AutoCAD.

FAQs:

1. What is numeracy?

Ans: Numeracy is the ability to understand and work with numbers, including basic arithmetic, measurements, and problem-solving.

2. How do fractions and decimals relate to measurements?

Ans: Fractions are often used in imperial measurements (e.g., $\frac{1}{2}$ inch), while decimals are common in metric measurements (e.g., 12.5 mm). Converting between them ensures accuracy.

3. What are common measuring tools?

Ans: Common tools include rulers, tape measures, vernier calipers, and micrometers, used for precise measurements in different applications.

4. What is the main difference between imperial and metric systems?

Ans: The imperial system uses inches, feet, and yards, while the metric system uses millimeters, centimeters, and meters. The metric system is based on powers of ten.

5. What are MKS, FPS, CGS, and SI systems?

Ans: MKS: Meter, Kilogram, Second FPS: Foot, Pound, Second

CGS: Centimeter, Gram, Second SI: International System, based on MKS

6. What is the formula for perimeter?

Ans: The perimeter of any polygon is equal to the sum of its sides.

Perimeter = Sum of all sides

7. What is the difference between area and perimeter?

Ans: The area is the region covered by shape or figure whereas perimeter is the distance covered by outer boundary of the shape.

The unit of area is given by square unit or unit² and unit of perimeter is same as the unit.

8. What is the formula for area of rectangle?

Ans: The area of rectangle is equal to the product of its length and breadth.

Area = Length x Breadth

9. What is the area of a circle with radius 3cm ,in terms of π ?

Ans: Given, $r = 3$ cm.

We know that the area of circle is πr^2 square units

Hence, $A = \pi \times 3^2 = 9\pi \text{ cm}^2$.

10. How do you find the area and perimeter?

Ans: Area = length x width of a regular polygon

Perimeter = length + length + length + length of a regular polygon

MCQs:

1. Which of the following is NOT a basic principle of numeracy?

- | | |
|-------------------------------|----------------------------|
| a. Understanding numbers | b. Recognizing patterns |
| c. Ignoring measurement units | d. Performing calculations |

2. What is $\frac{3}{4}$ expressed as a decimal?

- | | | | |
|---------|---------|---------|---------|
| a. 0.25 | b. 0.50 | c. 0.75 | d. 1.25 |
|---------|---------|---------|---------|

- 3. Which of the following time-saving practices is most effective in numerical problem-solving?**
 a. Estimation and approximation b. Guessing answers
 c. Avoiding calculations d. Skipping steps in solutions
- 4. A Vernier caliper is primarily used to measure**
 a. Weight b. Small linear dimensions
 c. Angles d. Electric current
- 5. How many millimeters are there in 1 inch?**
 a. 10.16mm b. 25.4mm c. 50.8mm d. 100mm
- 6. The metric system is based on powers of:**
 a. 2 b. 5 c. 10 d. 12
- 7. Which of the following is NOT a basic measuring unit in the SI system?**
 a. Meter b. Kilogram c. Foot d. Second
- 8. The FPS system of measurement stands for:**
 a. Foot-Pound-Second b. Force-Pressure-Speed
 c. Fractional-Physical-Scientific d. Force-Power-Strength
- 9. Convert 5 feet into inches.**
 a. 30inches b. 48inches c. 60inches d. 72inches
- 10. What is the equivalent of 1 meter in millimeters?**
 a. 10mm b. 100mm c. 1,000mm d. 10,000mm

True Answer

1.	c	2.	c	3.	a	4.	b
5.	b	6.	c	7.	c	8.	a
9.	c	10.	c				

Learning Outcomes:

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

- Perform Freehand Sketching
- Draw Geometrical Sketches
- drawnObjects on Different Scales
- Draw Lettering
- Draw Technical Drawings

Learning Unit 3.1**Perform Freehand Sketching****Learning Outcomes**

After completion of this Learning Unit, trainee will be able to:

- Arrange drawing tools
- Draw different types of lines
- Draw different objects
- Draw top, front, side views of objects/drawing (isometric)
- Perform drawing on both sides of paper
- Recycle drawing papers

3.1.1 Drawing tools

Artists and designers utilize a variety of drawing tools to bring their creative visions to life. These tools can be broadly categorized into traditional and digital mediums, each offering unique capabilities and experiences.

- Pencils:** Available in various grades from hard (H) to soft (B), pencils are fundamental for sketching and detailed work.



- Charcoal:** Charcoal pencils are used for drawing, sketching, and creating expressive marks. They're a popular medium because they're responsive, produce rich tones, and can be easily blended and erased.

Uses

- **Detailed drawings:** Charcoal pencils are good for detailed drawings because of their point.
- **Quick sketching:** Charcoal is a fast and responsive medium that's good for quick sketching.
- **Shading:** Charcoal pencils can be used to create highlights and shadows.
- **Contour hatching:** Follow the curved lines of an object to add depth and tone.

Remember

Wax-based pencils are softer and easier to blend while oil-based are firmer and more durable

Do you Know

Artist grade pencils richer pigments and better lasting than student grade pencils

Ink Pens:

Ink pens are primarily used for writing and drawing on paper, allowing users to apply ink to a surface for note-taking, letter writing, creating art. It provides precision and bold lines, suitable for detailed illustrations and technical drawings

Erasers:

Essential for correcting mistakes and refining sketches; types include rubber and kneaded erasers.

Blending Stumps:

Used to smudge or blend graphite and charcoal, creating smooth gradients.



Remember

- Use a light touch
- Working lairs
- Use different sides
- Clean regularly
- Avoid over-blending

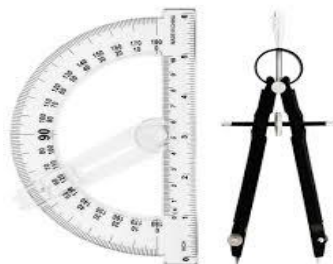
- i. **Rulers and T-Squares:** Assist in drawing straight lines and accurate measurements; T-squares are specifically used for horizontal lines on drafting tables.



Remember

Always align it properly for precise measurements
Held firmly to prevent slipping
Metal or wooden T-Square are more durable

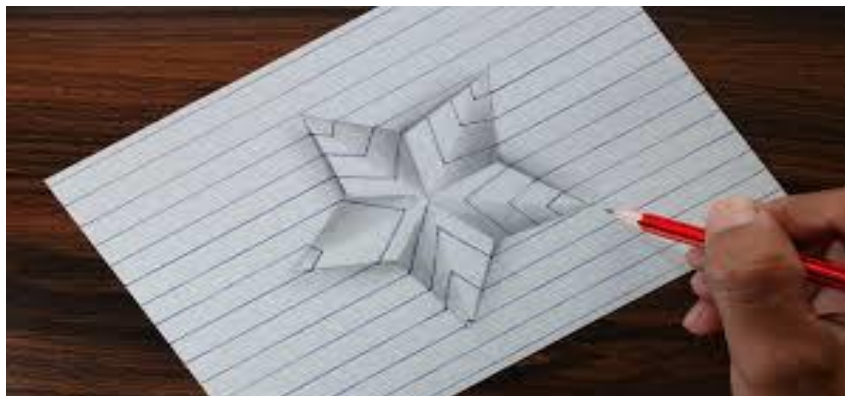
- ii. **Compasses and Protractors:** Essential for drawing circles, arcs, and measuring angles, commonly used in geometric and technical drawings.



Remember

Keep the needle sharp for stability and accuracy
A clean protector makes alignment easier

- iii. **Drawing Paper:** Comes in various textures and weights, chosen based on the medium and desired effect.



3.1.2 Drawing Materials

Drawing materials vary based on the medium and style you prefer. Here are some common materials:

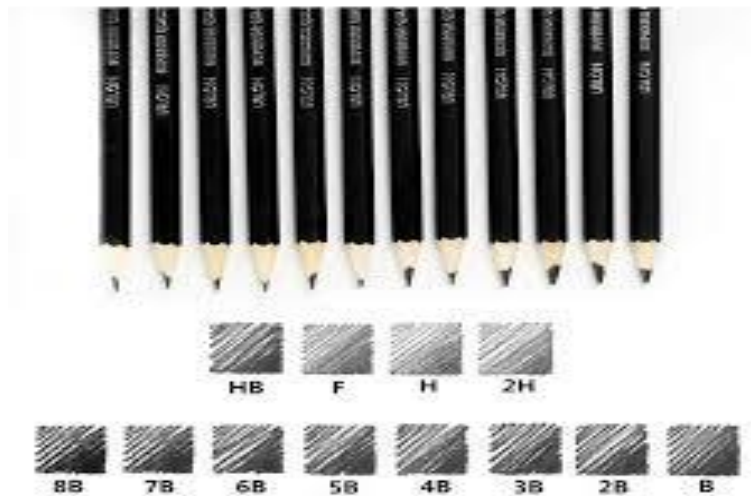
Basic Drawing Materials:

Pencils: Graphite pencils (H, HB, B grades)

The accuracy and appearance of a drawing depend very largely on the quality of the pencils used. The grade of a pencil lead is usually shown by figures and letters marked at one of its ends. Letters HB denote the medium grade, beginning of a drawing should be made with H or 2H pencil using it very lightly, so that the lines are faint, and unnecessary or extra lines can be easily erased. The final fair work may be done with harder pencils, e.g. 3H and upwards. Lines of uniform thickness and darkness can be more easily drawn with hard-grade pencils. H and HB pencils are more suitable for lettering and dimensioning. For freehand sketching, where considerable erasing is required to be done, soft-grade pencils such as HB should be used.

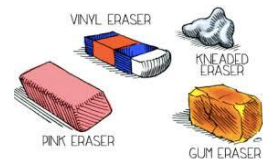
Remember

H(Hard) Pencils, lighters, finer lines and harder lead.
B(Black) Pencils, Softer, Darker Linens good for shading.
HB&F Middle ground pencils, balanced between harder and darker



Erasers:

- Soft erasers is the most suitable kind of eraser for pencil drawings. It should be such as not to spoil the surface of the paper. Frequent use of rubber should be avoided by careful planning.



Sharpener: Manual or electric

- A pencil sharpener is a tool for sharpening a pencil's writing point by shaving away its worn surface. Pencil sharpeners may be operated manually or by an electric motor.



Paper:

- Drawing papers are available in many varieties. For ordinary pencil-drawings, the paper selected should be tough and strong. It should be uniform in thickness and as white as possible.

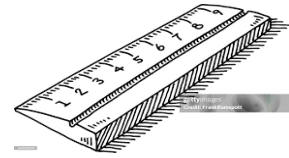
Sheet designation	Trimmed size (mm)	Untrimmed size (mm)
A0	841 × 1189	880 × 1230
A1	594 × 841	625 × 880
A2	420 × 594	450 × 625
A3	297 × 420	330 × 450
A4	210 × 297	240 × 330
A5	148 × 210	165 × 240

Remember

A5-A6 good for quick sketches
A4-A3 ideal for detailed drawings
A2-A1-A0 best for posters, Technical Drawings or large-scale art

Ruler: For precise lines and measurements

- Scales are made of wood, steel, celluloid or plastic or card board. Stainless-steel scales are more durable. Scales may be flat or of triangular cross-section.



Advanced Drawing Materials:

Colored Pencils:

- Colored pencils can be used to create art by layering colors, shading, and creating texture.

Pastels:

- Two types of pastels are commonly used, dry/soft pastels, oil pastels.
- Soft pastels are best applied to paper or card with texture as the friction this offers makes it easier to deposit colour and hold it in place. Special pastel papers and cards allow for a greater number of layers to be applied.

Remember

White enhances pastels softness while gold adds warmth and a touch of luxury.

Ink Pens:

- Common ink pen types include ballpoint pens, fountain pens, gel pens, which each have distinct ink flow and writing characteristics.

Markers:

- Markers can be used for drawing, coloring, and creating illustrations.

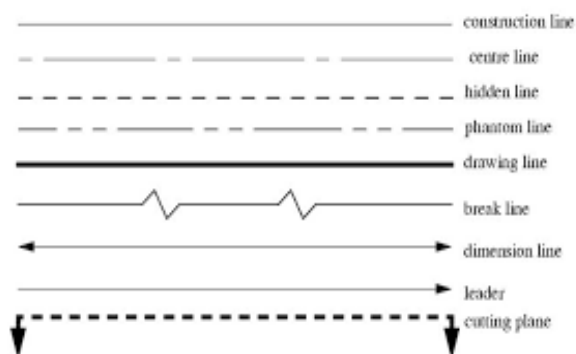
3.1.3 Types and Weight of Lines

- **Thin Lines:** Used for details, textures, and light outlines.
- **Thick Lines:** Used for defining main shapes, contours, and depth.
- **Tapered Lines:** Often used in dynamic sketches, calligraphy, or expressive drawings.

AUTOCAD IMPORT	REVIT LINES	
		1 - 0.10mm
		2 - 0.22mm
		3 - 0.35mm
		4 - 0.5mm
		5 - 0.7mm
		6 - 1.0mm
		7 - 1.4mm
		8 - 2.0mm
		9 - 3.0mm

3.1.4 Types of Line Thickness in Drawing

- **Contour Lines:** Medium to thick, outlining objects.
- **Construction Lines:** Very light (thin and often erased later).
- **Cross-Contour Lines:** Medium, follow the shape's form to add depth.
- **Hatching & Cross-Hatching:** Thin lines for shading and texture.
- **Gesture Lines:** Varying thickness for expressive movement.



Remember

Thick Lines attract more attention while thinner lines appear more delicate and suitable

3.1.5 Importance of Recycling

Recycling provides many benefits to our environment. By recycling our materials, we create a healthier planet for ourselves and future generations.

Benefits of Recycling

Do you Know

- Protects Ecosystems and Wildlife.
- Conserves Our Natural Resources.
- Saves Energy.
- Reduces the Need to Harvest New Materials.
- Reduces Carbon Emissions.
- Saves Money.
- Brings People Together.
- Educates People About the Importance of Protecting the Environment.

Three key principles of recycling are
Reduce, Reuse, Recycle

3.1.6 Methodology of Stretching of Sheet for Drawing

The stretching of a sheet for drawing is a method used to keep your paper flat and prevent it from buckling or warping when using water-based media like watercolors or ink work. Here's a step-by-step guide on how to properly stretch a sheet of paper for drawing or painting:

What You'll Need:

- Watercolor or heavyweight drawing paper (ideally 140 lb / 300 gsm or more)
- A clean basin or sink
- A flat board (wood, plexiglass, or gatorboard)
- Gummed tape or masking tape (gummed is better)
- Sponge or towel

Steps to Stretch the Paper:

- **Soak the Paper:**
 - Submerge the paper completely in cold water for 5–10 minutes (less if thinner paper).
 - For heavier paper (like 300 gsm), soak longer—around 10–15 minutes.
- **Remove and Drain:**
 - Carefully lift the paper out.
 - Let the excess water drain off for a few seconds, then gently blot the surface with a sponge or clean towel—don't rub.
- **Mount on Board:**
 - Place the damp paper flat onto your board. Smooth it out gently from the center to edges to remove air bubbles or wrinkles.
- **Tape the Edges:**
 - Use gummed tape (activated with water) to secure all four edges of the paper to the board.
 - Press the tape down firmly, making sure it overlaps the edges by about ½ inch on both the paper and the board.
- **Dry Flat:**
 - Let the paper dry completely—this can take several hours or overnight. Make sure it's in a cool, dry place and stays flat.
- **Ready to Use:**
 - Once dry, the paper will be tightly stretched and won't buckle when you paint or draw on it.

Remember

Don't try to draw while the paper is still damp unless you want specific effects (like in watercolor).



Remember

After finishing your artwork, you can cut around the taped edges to remove the piece cleanly.

Activity 1:

Practice to draw different objects.

Activity 2:

Practice to draw elevations and top view of the objects/drawing (isometric)

Learning Unit 3.2

Draw Geometrical Sketches

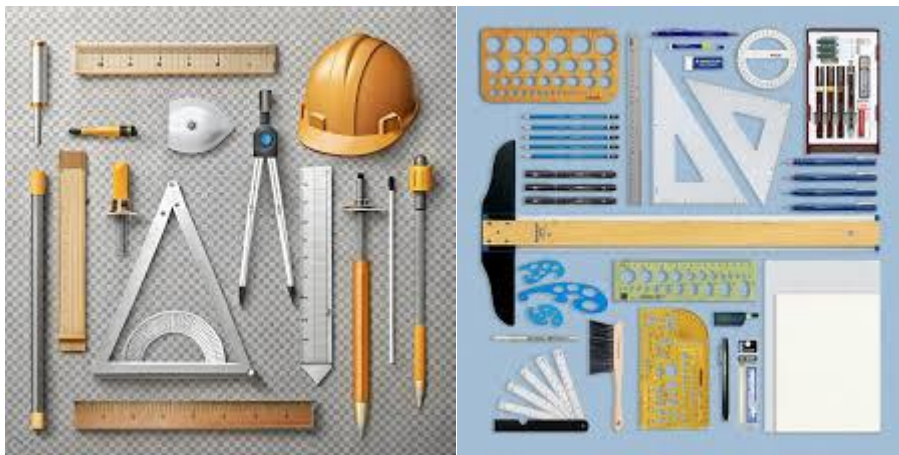
Learning Outcomes

After completion of this Learning Unit, trainee will be able to:

- Arrange drawing tools
- Draw different types of Angular shapes
- Draw Different types of Polygon and Geometrical Shapes

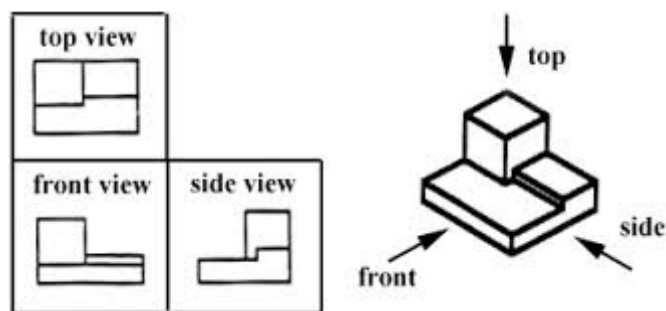
3.2.1 Drafting tools

Drafting tools and equipment include T-squares, triangles, scales, compasses, protractors, templates, French curves, erasers, and paper. T-squares are used to draw horizontal and vertical lines while triangles are used to draw angles. Scales are used to measure and enlarge or reduce drawings.



3.2.2 Types of Views

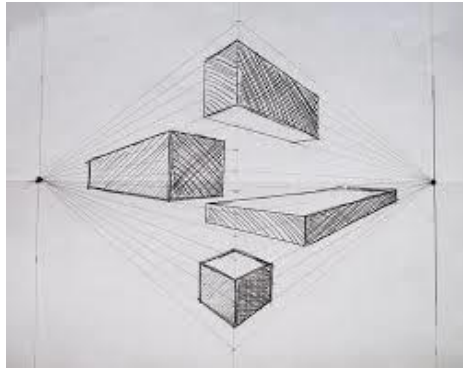
There are different types of views under orthographic views, such as front, back, right, left, top and bottom views.



There are three types of pictorial views: perspective. isometric. oblique.

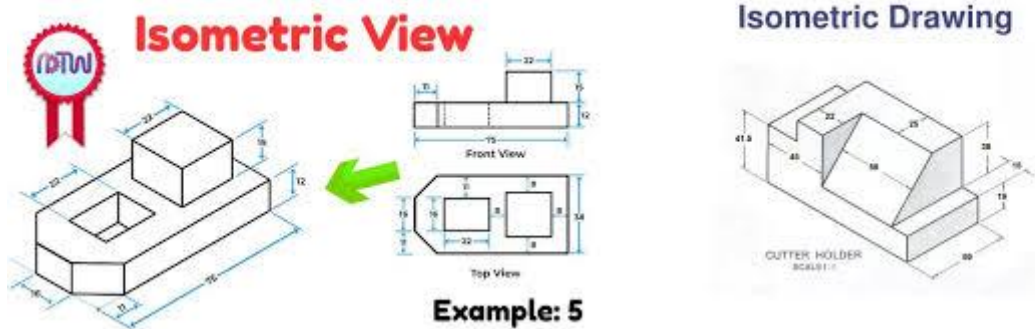
Perspective

In drawing, perspective is a technique that creates the illusion of depth and spatial relationships on a two-dimensional surface, making objects appear three-dimensional.



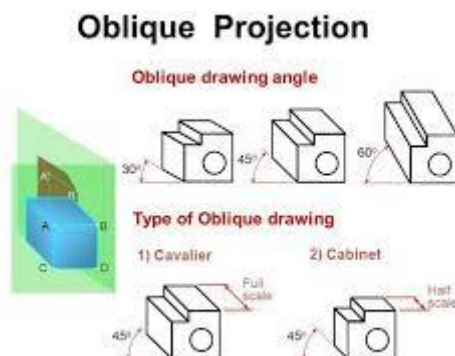
Isometric view

An isometric view is a two-dimensional representation of a three-dimensional object, where the axes are aligned to create a clear, undistorted view of the object. It's a way to draw 3D shapes on a 2D surface, keeping the proportions and relative sizes of the object's features accurate.



Oblique view

An oblique view is a type of technical drawing or graphical projection that depicts a three-dimensional object in a two-dimensional image. It's characterized by a drawing angle where one face of the object is drawn in its true size, while receding lines are extended at an angle, typically 30 to 45 degrees, to create the illusion of depth.

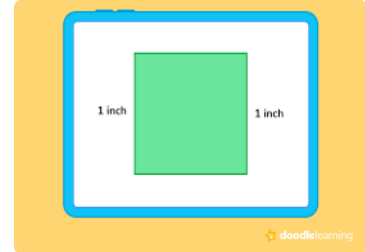


3.2.3 Concept of Geometric Construction

Geometric shapes are mathematical shapes. They are perfect and regular. They are characterized by straight lines, angles and points. An exception to this would be a perfect circle as it has no straight lines or points. Other geometric shapes are squares, rectangles, triangles, parallelograms, hexagons etc.

- **Square.**

Square is one of the most common two-dimensional shapes with 4 sides of equal length.



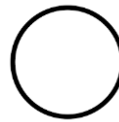
- **Rectangle**

A polygon with four sides and four right angles is called a rectangle. It has two parallel sets of sides, and the lengths of the opposite sides.



- **Circle**

A circle is a two-dimensional shape with a closed boundary. It has a round shape without any corners or lines.



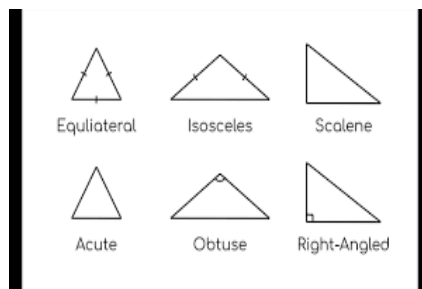
Remember

- **Radius (r)** – Distance from the center to any point on the circle.
- **Diameter (d)** – The longest chord, passing through the center.
- **Circumference (C)** – The perimeter of the circle.
- **Area (A)** – The space inside the circle

- **Triangle**

The triangle is also a closed two-dimensional figure. However, it contains 3 sides.

There are some types of triangles listed below.

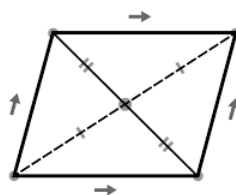


Remember

- **Opposite Sides:** Both pairs are parallel and equal in length.
- **Opposite Angles:** Equal in measure.
- **Consecutive Angles:** Adjacent angles are supplementary, summing to 180°.
- **Diagonals:** They bisect each other, dividing the parallelogram into two congruent triangles

- **Parallelogram**

The term “parallelogram” refers to a four-sided polygon with two sets of parallel sides. It has opposite sides equal in length and opposite.



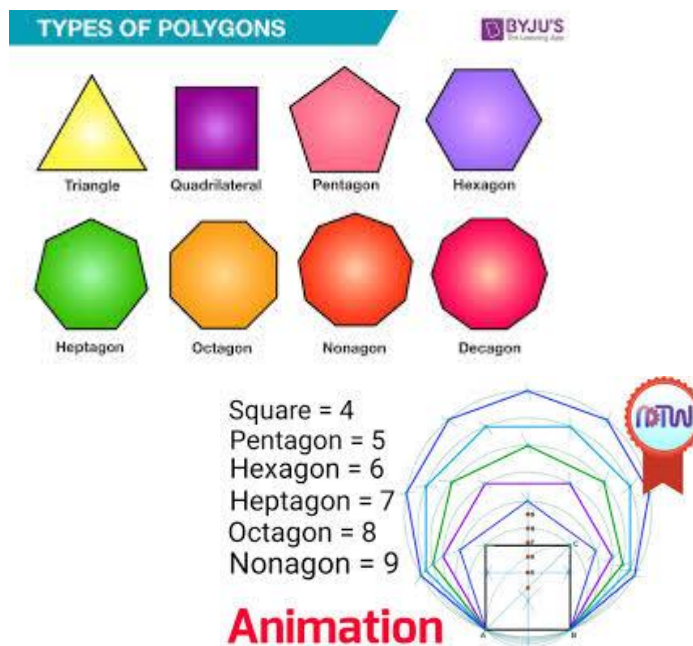
- **Polygons**

A polygon is any 2-dimensional shape formed with straight lines. Triangles, quadrilaterals, pentagons, and hexagons are all examples of polygons. The name tells you how many sides the shape has. For example, a triangle has three sides, and a quadrilateral has four sides.

Remember

- **Regular Polygon:**
All sides and interior angles are equal (e.g., equilateral triangle, square).
- **Irregular Polygon:**
Sides and/or interior angles are not all equal.

Types of Polygons



Activity:1

Draw square, triangle and circle by method.

Activity:2

Draw a circumscribe circle with pentagon

Activity:3

Draw an inscribe circle with Hexagon

Learning Unit 3.3

Draw Objects on Different Scales

Learning Outcomes

After completion of this Learning Unit, trainee will be able to:

- Arrange Scale tools
- Draw different Patterns with different Scales

3.3.1 Importance of Scale for Drawing

The importance of scale in drawing is huge, especially when accuracy and proportion matter like in architectural, technical, or figure drawing.

- **Maintains Proportions**
 - Scale ensures that all elements in your drawing are in the correct size relation to each other.
 - Whether you're drawing a room, a person, or a machine, getting the size relationships right makes the drawing realistic and believable.
- **Helps with Planning & Design**
 - In fields like architecture, engineering, and fashion design, scale helps translate a small drawing into a real-life object.
For example: 1:100 scale in architecture means 1 unit on paper = 100 units in real life.
- **Allows Accurate Measurements**
 - A scaled drawing can be used to measure distances, lengths, and sizes accurately without having to physically measure the real object.
- **Improves Composition**
 - Knowing the scale lets artists plan space better—balancing foreground, background, and objects properly.
 - It helps avoid objects being accidentally too big or too small within the scene.
- **Supports Communication**
 - Scaled drawings can be shared with others (like clients or teammates), and everyone will understand the real-life size of what's being shown—even if they've never seen the actual thing.
- **Essential for Enlargement or Reduction**
 - If you're enlarging a small sketch into a mural, or shrinking a real object into a model, scale ensures that you maintain correct proportions throughout the transition.

3.3.2 Types of Architectural Scales

Architectural scales are often represented as ratios (like 1:100) or fractions (like $\frac{1}{4}" = 1'-0"$) depending on the region.

Metric Scales (Common outside the U.S.)

Scale	Used For
1:500	Site plans (shows layout of buildings and roads)
1:200	Larger site plans, small buildings in context
1:100	Floor plans, elevations, and sections (standard for building design)
1:50	More detailed floor plans, elevations, and sections
1:20	Room layouts and interior details
1:10	Furniture and fixtures
1:5, 1:2, 1:1	Very detailed parts, construction, or product design

Imperial Scales (Common in the U.S.)

Scale	Used For
$\frac{1}{16}" = 1'-0"$	Site plans
$\frac{1}{8}" = 1'-0"$	Floor plans for large buildings
$\frac{1}{4}" = 1'-0"$	Standard floor plans, sections, elevations
$\frac{1}{2}" = 1'-0"$	More detailed plans and interior elevations
$1" = 1'-0"$	Detailed views of specific parts
$3" \text{ or } 6" = 1'-0"$	Construction details

3.3.3 Dimension Standards

Dimension standards in engineering refer to established guidelines and conventions for placing and interpreting dimensions on technical drawings. These standards ensure clarity, consistency, and accuracy in conveying the physical characteristics of objects. They cover aspects like how to indicate size, shape, and location of features.

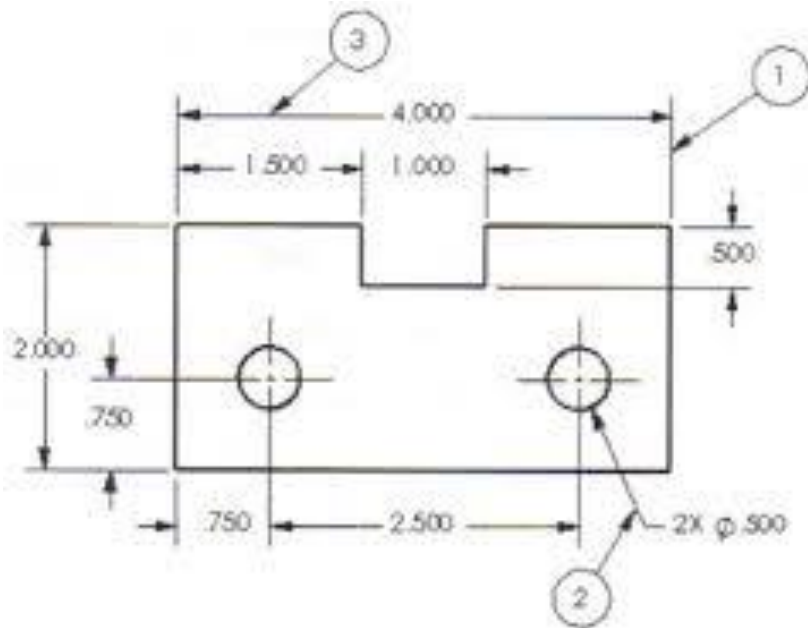


Figure D1006.01.01

Activity 1:

Practice to draw objects on different scales.

Learning Unit 3.4

Draw Lettering

Learning Outcomes

After completion of this Learning Unit, trainee will be able to:

- Arrange drawing tools
- Draw lettering strokes
- Draw different lettering styles

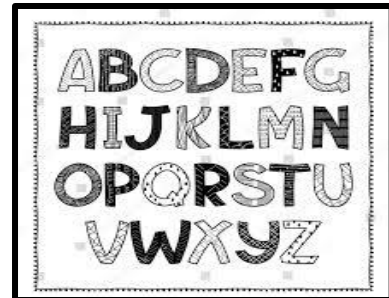
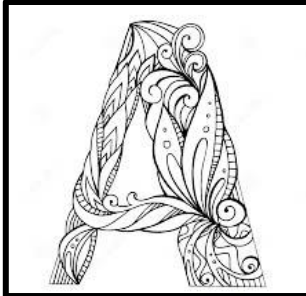
3.4.1 Different Styles/Fonts free hand

In the fields of design and architecture, all blueprints, drawings, and designs use a form of architectural lettering. This style of architectural handwriting, simply stated, is block letters that are universally easy to read.



3.4.2 Lettering in Different Styles and Sizes

“Free- hand lettering is drawing or executing legible letters without the assistance of tools: guides, measurement tools, and other aides. In design and drafting freehand lettering is typically drawn in a “Gothic” style. Freehand lettering skills are developed through practice. There are are a lot of different font styles to which makes drawing more interesting.



American	<i>Bickham</i>	<i>Kauffman</i>	<i>Park Avenue</i>
Amos	<i>Compton</i>	Koch, Amiga	Praxis
Anna	Caslon	<i>Kunstler</i>	<i>Philly</i>
<i>Aritus</i>	Chalkboard	<i>Linotype</i>	Skia
Arquitectura	Comic Sans	<i>Linotype</i>	<i>Snell</i>
Avalon	Eras	<i>Linotype</i>	<i>Spring</i>
<i>Bailey</i>	Eurostile	<i>Maraca</i>	STENCIL
<i>Ballentine</i>	FAJITA	Marker	Stone
<i>Balmoral</i>	<i>Fine hand</i>	<i>Medici</i>	Tekton
Baskerville	Footlight	Middleton	Template
Bauhaus	Friz Quadra	<i>Mistral</i>	Tiffany
<i>Bellvue</i>	Futura	Novarese	Trebuchet
Belwe	Galashad	Nueva	Utopia
Berliner	<i>Orbit</i>	<i>Kapital</i>	<i>Van Dyke</i>
Bernadette	Gilly Up	Optima	Vogelbein
<i>Bickham</i>	<i>Gigi</i>	<i>Orbit</i>	Velveteen
<i>Bickley</i>	Hadfield	Palatino	<i>Vivante</i>
BINNER	Helvetica	Papyrus	Worsheld Sting
<i>Braganza</i>	Janson	<i>Parisian</i>	<i>Zapfino</i>
<i>Brush</i>	Kabel	<i>Phyllis</i>	

Common Font styles

Arial

Arial is a popular sans-serif typeface, Monotype, known for its clean and readable style, and is often used in documents and web design.

Times New Roman

Times New Roman is a transitional serif typeface designed by Stanley Morison and Victor Lardent, commissioned for use by the British newspaper “The Times” in 1931, and it’s known for its legibility and widespread use in documents and printed materials.

Arial aaaa

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz

Times New Roman

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
0123456789

Sans serif fonts

The term “sans-serif” is French for “without serifs”. Designers know sans-serif fonts for simplicity, clarity, and modern appearance. Sans serifs tend to have more uniform line widths than serif fonts.



Activity :1

Draw different lettering font styles in different sizes

Learning Unit 3.5

Draw Technical Drawings

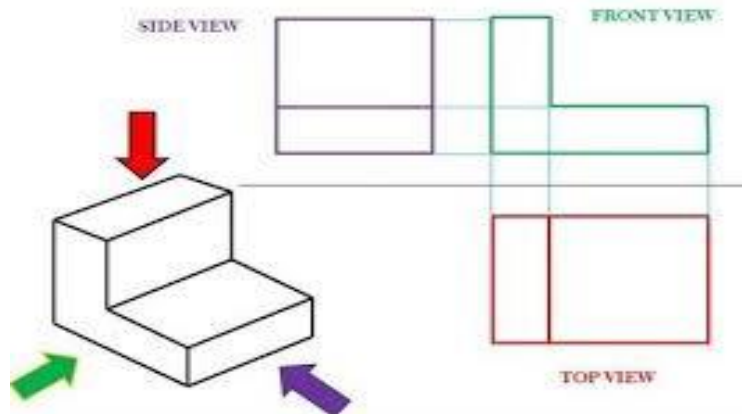
Learning Outcomes

After completion of this Learning Unit, trainee will be able to:

- Develop Orthographic Projection
- Draw Types of Doors
- Draw Types of Windows
- Draw Types and parts of Staircase
- Draw plans, elevations and sections on different scales

3.5.1 Concept of Orthographic Projections

Orthographic projection is a method of representing three-dimensional objects in two dimensions. It is widely used in engineering, architecture, and technical drawing to create accurate and scalable representations of objects. An orthographic projection consists of 3 orthographic views: the front view, the top view, and the side view.



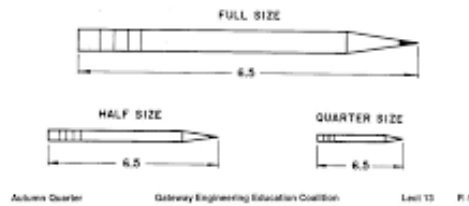
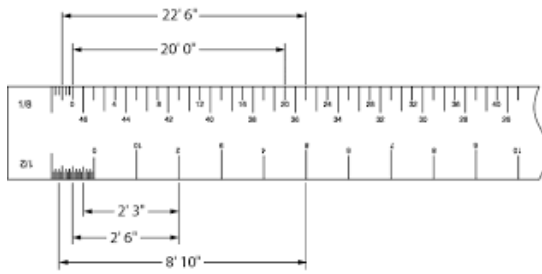
Orthographic projection has two main types: first-angle projection and third-angle projection. Additionally, axonometric projections (isometric, dimetric, and trimetric) are considered subtypes of orthographic projection, representing 3D objects in a 2D format.

3.5.2 Scale & Dimensioning Standards

Scale and dimensioning standards ensure clear and consistent communication on drawings. Scales, like 1:1 (full size) or 1:50, indicate the relationship between the drawing and the real object, while dimensioning provides specific measurements. Dimensioning standards specify how to place dimensions, use extension lines, and handle features like arcs, cylinders, and holes

Scaling vs. Dimensioning

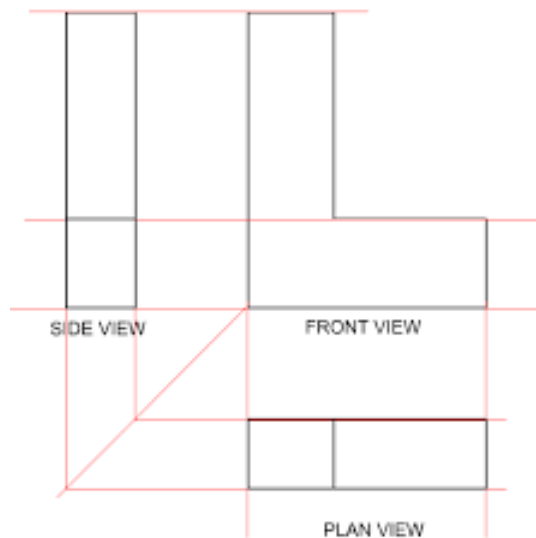
- Drawings can be a different scales, but dimensions are ALWAYS at full scale.



3.5.3 1st & 3rd Angle Projection Method

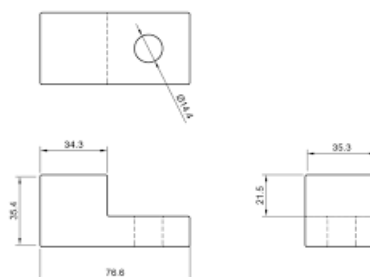
1st Angle Projection Method

In First Angle Orthographic Projection, there are three primary types of views: Front View (Elevation), Top View (Plan), and Side View (Section). These views are used to represent a 3D object on a 2D surface, providing a comprehensive understanding of the object's shape and features



3rd Angle Projection

In third-angle orthographic projection, a 3D object is represented by a series of 2D views, with the front view typically placed at the lower left of the drawing. Other views, like the top and right views, are positioned around the front view to complete the representation.



3.5.4 Seal / Title Strip/Block

In engineering drawings, a title block is an essential element that provides critical information about the drawing and the part or assembly it represents. Typically located in the lower right corner of the drawing sheet, the title block includes details such as:

- **Drawing Number:** A unique identifier for the drawing.
- **Title or Description:** The name or description of the part or assembly depicted.
- **Company or Organization Name:** The entity responsible for the drawing.
- **Scale:** The ratio of the drawing's dimensions to the actual object's dimensions.
- **Drawing Size:** The standard size designation of the drawing sheet.
- **Projection Method:** The type of projection used (e.g., first-angle or third-angle), often shown symbolically.
- **Drafter and Approvals:** Names or initials of the drafter, checker, approving officer, and dates of actions.
- **Material Specifications:** The material from which the part is to be made.
- **Revision Information:** Revision number or letter indicating the drawing's version.
- **Sheet Number:** If part of a multi-sheet set, the specific sheet's number.

Remember

- Seal block contains crucial details like project name, drawing title, drawing no. revision history and date
- Must be clear and readable typically placed in the bottom right corner for

Title Block

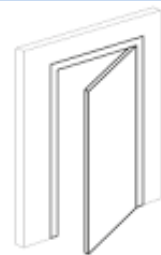
	Name	Date	Training Institute Name
Drawn By			
Checked By			
Drawing No.	Drawing Name		Scale

3.5.5 Types of Doors

Hinged Door

The hinged door is the most classic type of door. It consists of a frame and one or more leaves. The frame is composed of lateral and upper doorjambes fixed to the wall, that is the structure on which the doors are mounted

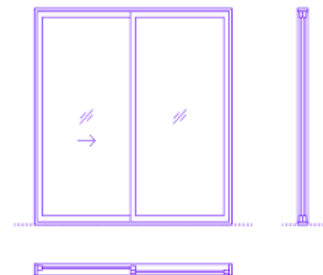
- Most common type.
- Swings open and closed on hinges.
- Can be single or double-leaf.
- Used for: Rooms, main entrances.



Sliding Door

Sliding door is a type of door which opens horizontally by sliding, usually parallel to (and sometimes within) a wall. Sliding doors can be mounted either on top of a track below or be suspended from a track above.

- Moves horizontally on a track.
- Saves space.
- Used for: Balconies, wardrobes, modern interiors.

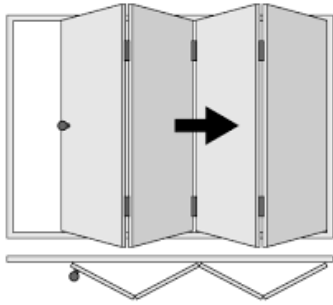


Folding Door (Accordion or Bi-fold)

A folding door, also known as a bi-fold door, consists of multiple panels that fold back against a wall, creating a seamless connection between indoor and outdoor spaces, or between rooms

- Made of multiple panels that fold against each other.

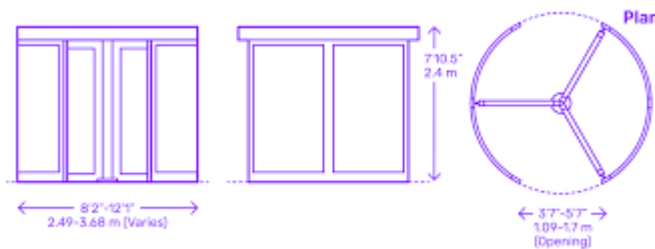
- Used for: Closets, partition spaces, balconies.



Revolving Door

A revolving door is a type of door that consists of multiple panels rotating on a central axis, allowing people to enter and exit a building without a significant draft.

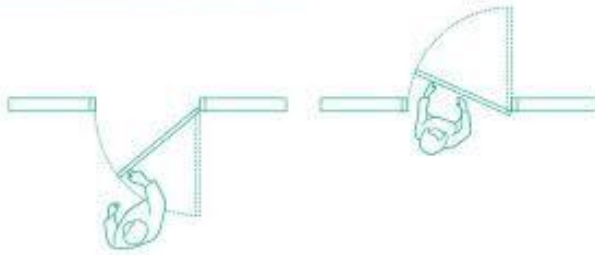
- Rotates around a central shaft with 3 or 4 leaves.
- Used in: Hotels, airports, shopping malls (for controlling air flow and traffic).



Swing Door

- Can swing in both directions (inward and outward).
- Often has spring hinges.
- Used in: Hospitals, restaurants, kitchens.

Dimensions Guide | Swinging | Hinged Door



Flush Door

A flush door is characterized by its smooth, flat surface on both sides, creating a clean, modern look.

- Smooth surface with a hollow or solid core inside.
- Simple, sleek, economical.
- Used for: Interior rooms, bathrooms.



Panel Door

- A panel door is usually made up of two to eight rectangular or square panels, but they sometimes have a mixture of both. These doors are traditionally made using multiple pieces of wood to form patterns that create the look of a panel door.
- Has frames and panels (can be wood or glass).
- Classic and decorative.
- Used for: Main doors, interiors.

Louvered Door

A louvered door is an interior door featuring horizontal slats (louvers) that allow for ventilation and privacy, often used in closets, bathrooms, or laundry room.

- Has angled slats to allow ventilation.
- Used for: Laundry rooms, bathrooms, closets.

Glass Door

A glass door is a door constructed primarily or partially from glass, often used to allow natural light and visibility while also acting as a barrier between spaces.

- Fully or partially made of glass.
- Used for: Office entrances, balconies, showrooms.



3.5.6 Types of Windows

Casement Window

A casement window has a hinge on one side, allowing it to crack open in an outwardly direction for ventilation. It is different from a sliding window; in that it is attached to the window frame and swings open. A definition of the word casement is a window sash that opens in hinges at the side.



Remember

- Hinged at the side.
- Opens outward like a door.
- Provides good ventilation.
- Common in: Bedrooms, kitchens.

Sliding Window

A sliding window is a window that opens by sliding horizontally along a top and bottom track in the window frame. It is somewhat similar to a double-hung window, just turned on its side.

- Moves horizontally on a track.
- Space-saving.

- Common in: Modern homes, offices.



Fixed Window (Picture Window)

A fixed window, also known as a picture window, is a non-operable window designed to maximize views and natural light, offering an unobstructed view without the ability to open or close

- Doesn't open.
- Used for light and views.
- Common in: Living rooms, stairwells.



Double-Hung Window

A double-hung window, also commonly referred to as a double-sash window, it has two operable sashes that slide up and down. There are two main operable parts of a double-hung window — the top sash and the bottom sash. They are both able to open to provide ventilation.

- Two sashes slide vertically.
- Both top and bottom can open.
- Common in: Traditional homes.



Single-Hung Window

A single-hung window, also known as a single-sash window, with a lower, operable sash and an upper, fixed sash. This means that the bottom part of the window slides up and down, while the top part remains stationary.

- Similar to double-hung, but only bottom sash moves.
- More affordable version.



Bay Window

A bay window is a window space projecting outward from the main walls of a building and forming a bay in a room. It typically consists of a central windowpane, called a fixed sash, flanked by two or more smaller windows, known as casement or double-hung windows. The arrangement creates a panoramic view of the outside, allows more natural light to enter the room, and provides additional space within the room.

- Projects outward from the wall.
- Has three panels—center is fixed, sides are operable.
- Adds space and light.
- Popular in living and dining areas.



Bow Window

Bow windows, also known as compass windows, are curved window designs that project outwards from a building's exterior wall, creating a semi-circular or curved shape, typically using four or more windows of the same size.

- Similar to bay, but curved with 4+ panels.
- Softer, rounded look.



Louvered Window (Jalousie)

A louvered window, also known as a jalousie window, features parallel glass, acrylic, or wooden slats (louvers) within a frame that can be tilted open and shut together to control airflow and light, often using a crank.

- Made of horizontal glass slats.
- Tilts open for ventilation.
- Used in warm, tropical climates.



Skylight (Roof Window)

Skylights are architectural elements designed to infuse natural light and brighten the interiors. Often known as “roof lights” or “roof windows,” these design gems flood natural light into spaces, reducing reliance on artificial lighting and boosting energy efficiency.

- Set into the roof or ceiling.
- Brings natural light into dark spaces.
- Can be fixed or operable.



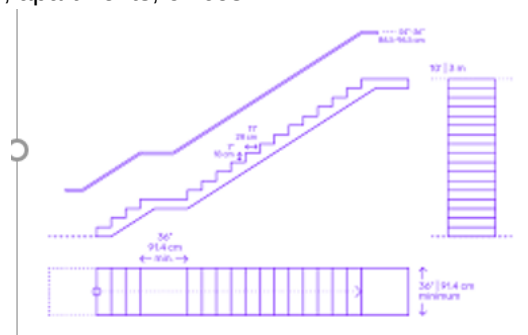
5.5.7 Types of Staircases

Straight Staircase

Straight-Run Stairs are stairs without changes in any direction. They are one of the most common types of stairs found in both residential and commercial properties.

No turns or changes in direction.

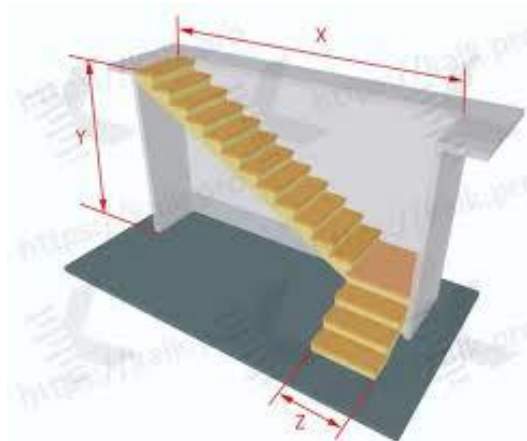
- Simple, easiest to build and climb.
- Common in: Homes, apartments, offices.



L-Shaped Staircase (Quarter Turn)

A Quarter Turn staircase changes its direction to the right or left, but the affected portion of the turn introduces a quarter space landing or winders

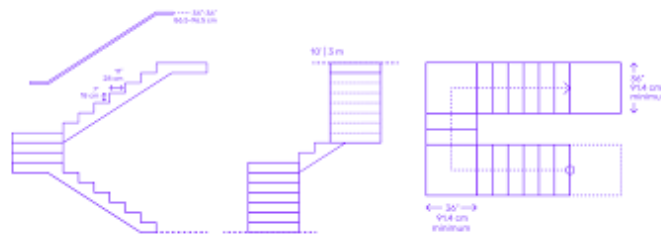
- Has one turn, usually 90° at a landing.
- Saves space and adds visual interest.
- Often used in corners or narrow spaces.



U-Shaped Staircase (Half Turn)

U shaped stairs are essentially two parallel flights of straight stairs joined by a landing that creates a 180-degree turn in the walk line.

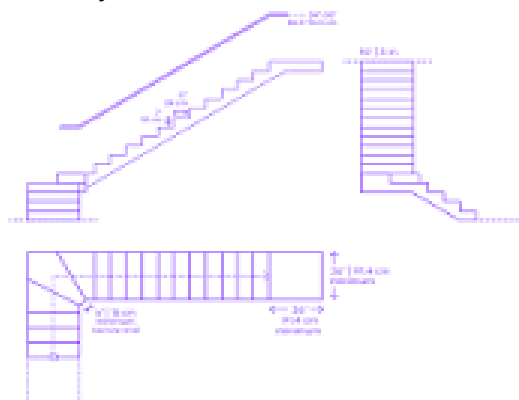
- Two straight flights with a 180° turn at a landing.
- Compact and practical.
- Common in: Duplex homes, commercial buildings.



Winder Staircase

A type of combined staircase (both straight and curved sections) with no landings, so the turns of the staircase can add steps, thereby shortening the staircase.

- Similar to L or U-shaped but uses triangular steps instead of a landing.
- Saves even more space.
- A bit harder to walk on safely.

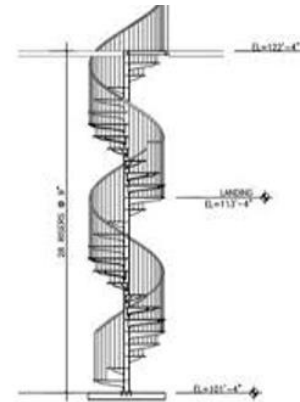
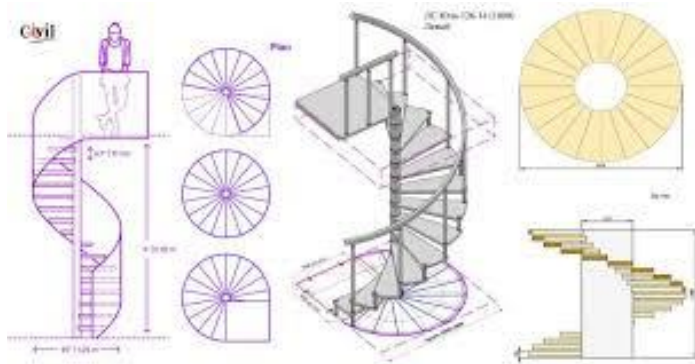


Spiral Staircase

A structure that is built around a central post that acts as an axis for its steps. The origin of this type of staircase dates back to the Middle Ages. They were used both for aesthetic purposes and for defense.

- Circular in shape, steps wind around a central pole.
- Very compact, decorative.

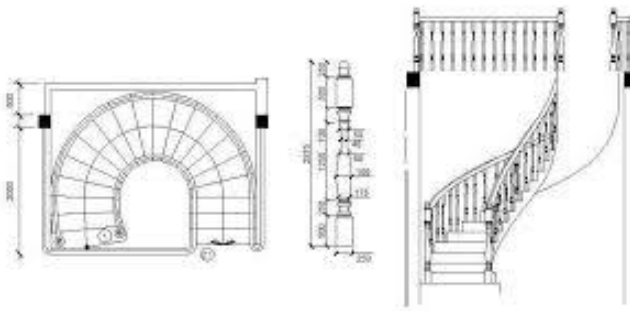
- Used in: Lofts, small areas, balconies, terraces.



Helical Staircase (Curved Staircase)

Helical stairs do not have a central column and is curved in shape. They are made up of two rolled stringers with treads fixed between them.

- Smooth, elegant curve—no central pole like spiral.
- Visually striking and spacious.
- Found in: Luxury homes, hotels, public buildings.



Bifurcated Staircase

Split Stairs are also known as bifurcated stairs typically have a wide set of stairs starting at the bottom that ends at a landing partway up the flight. The stairs split at the landing into two narrower sets of stairs leading in opposite directions.

- Grand staircase that splits into two smaller flights at a landing.
- Very elegant and dramatic.
- Seen in: Palaces, theaters, large buildings.



Circular Staircase

A circular staircase is a staircase designed and constructed in a circular form, often used for both residential and commercial purposes to create a dramatic and elegant interior feature.

- Similar to helical but often a full 360° loop.

- Visually appealing, more space-consuming.

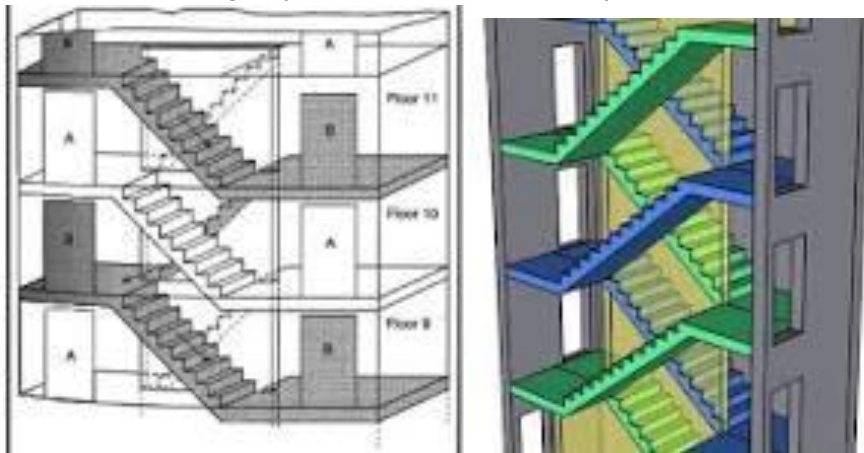
Scissor Staircase

- Two staircases overlapping in a compact vertical space.
- Used in: Apartments and emergency exits.

Ladder Staircase

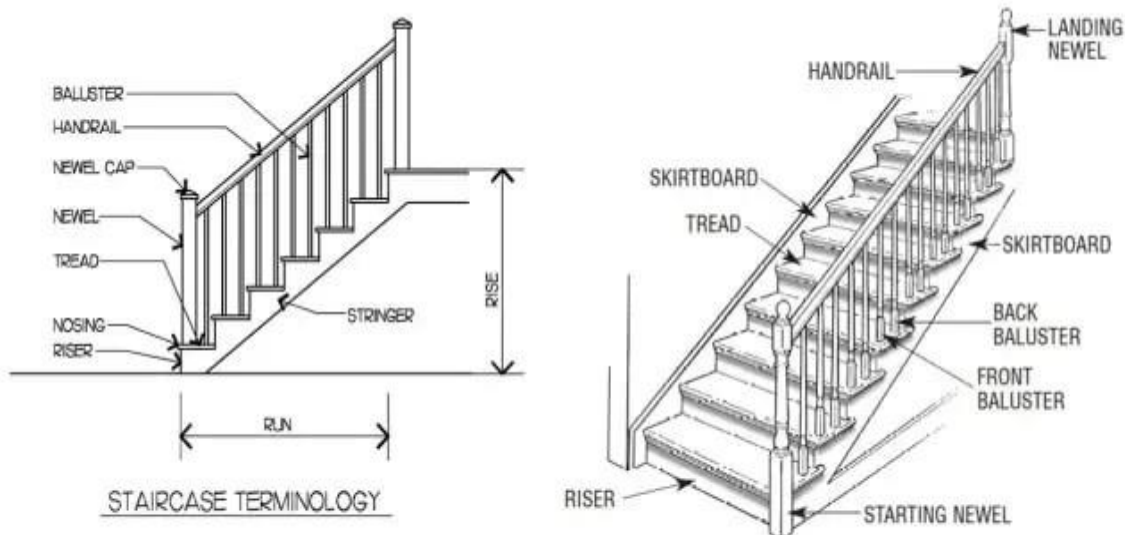
Scissor stairs were often used in the early 1900's to separate men and women from traveling in the same areas. These stairs usually contain two separate stairs within a single stair enclosure.

- Steep and compact, more like a ladder.
- Used for: Lofts, attics, tight spaces—not suitable for frequent use.



Parts of staircase

- **Risers**
The riser is the vertical surface of the stair.
- **Treads**
The tread on the other hand is the horizontal surface of the stair and the part of the stair you step on.
- **Nosing**
Nosing is the portion of the tread that overhangs the front of the riser.



Components Of Stair

Plan

A house plan is a set of construction or working drawings (sometimes called blueprints) that define all the construction specifications of a residential house such as the dimensions, materials, layouts, installation methods and techniques.



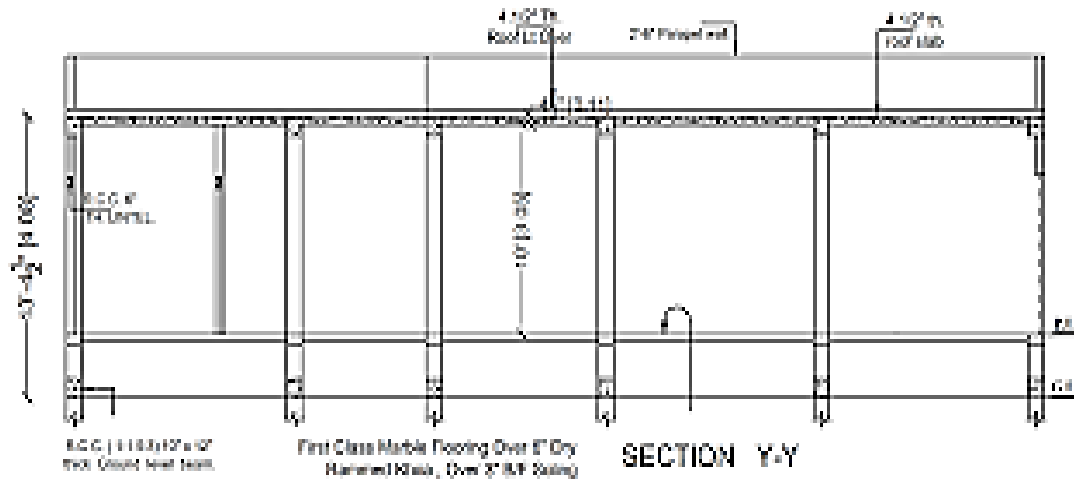
Elevation

In the context of architecture and construction, “house elevation” refers to a 2D, scaled drawing of a building’s exterior, showing a straight-on view of one side, typically the front, back, or sides, to illustrate the building’s design and features.



Section

Section views allow for a detailed examination, cutting the project into a vertical piece that shows the hidden details of its construction. They act like x-rays for architectural design, showing the small but important aspects of space organization and structural details.



Activity 1:

Practice to draw orthographic projections

Activity 2:

Practice to draw doors, windows detail.

Activity 3:

Practice to draw staircase details.

Activity 5:

Practice to draw plan, elevation and sections of given project on different scales

SUMMARY

Performing basic manual drawing involves fundamental techniques such as understanding of shapes & lines, hand control & grip on pencil correctly for smooth strokes and better precision, shading & textures, hatching, cross-hatching, and blending to create depth, proportions & perspective and maintain correct proportions and use vanishing points for perspective drawing.

FAQs:

Q1. Write any four types of geometrical shapes?

Ans: Circle, Square, Rectangle, Triangle.

Q2. Define orthographic projection?

Ans: A method of representing 3D objects in 2D, showing top, front, and side views.

Q3. What is isometric view?

Ans: A 3D representation where all axes are equally foreshortened and angles are 120°.

Q4. Write any five tools used in freehand sketch drawing?

Ans: Pencils, Erasers, Rulers, Compass, Protractor.

Q5. Write types of triangles?

Ans: Equilateral, Isosceles, Scalene, Right-Angle, Acute, Obtuse.

Q6. What is the purpose of creating a seal block in technical sheets?

Ans: It validates the drawing by showing approval or certification.

Q7. Name the types of polygons.

Ans: Triangle, Quadrilateral, Pentagon, Hexagon, Octagon, etc.

Q8. How many types of perspectives are in use?

Ans: One-point, Two-point, Three-point perspective.

Q9. How many types of doors are commonly used?

Ans: 09 types of doors are commonly used

Q10. Where the sky lights are located in a building?

Ans: Sky lights are located at the ceiling and roof of the building

MCQs

1. Which sketching technique uses light, quick strokes to outline the shape before adding details?

- a. Cross-hatching b. Contour drawing c. Gesture drawing d. Blending

2. What tool is commonly used for blending in sketching?

- a. Eraser b. Tortillon (blending stump)
c. Ruler d. Ink pen

3. Stippling is a technique that involves:

- a. Using parallel lines for shading b. Creating tones with tiny dots
c. Smudging graphite for smooth shading d. Drawing with continuous strokes

4. Which type of shading technique creates soft and smooth gradients?

- a. Hatching b. Cross-hatching c. Stippling d. Blending

5. What does the letter “H” on a drawing pencil indicate?

- a. Hardness b. Softness c. Darkness d. Thickness

6. Which pencil is the softest among the following?

- a. 2H b. HB c. 4B d. 6H

7. What does the letter “B” in pencil grading stand for?

- a. Bold b. Black c. Blending d. Basic

8. Which pencil is commonly used for general writing and sketching?

- a. 6B b. 4H c. HB d. 8B

9. What is the primary characteristic of charcoal pencils compared to graphite pencils?

- a. They are harder and lighter b. They produce darker and richer blacks
c. They are more precise and fine-tipped d. They are waterproof

10. Which of the following is NOT a type of charcoal pencil?

- a. Soft b. Medium c. Hard d. Mechanical

11. What is the primary use of a T-Square?

- a. Measuring angles b. Drawing straight horizontal lines
c. Cutting paper d. Mixing colors

12. In which profession is a T-Square most commonly used?

- a. Architecture and drafting b. Medicine
c. Cooking d. Sculpture

13. What is a seal block primarily used for?

- a. Cutting materials b. Creating stamped impressions
c. Measuring angles d. Sharpening pencils

14. Which of the following is a plane geometrical figure?

- a. Sphere b. Cube c. Triangle d. Cylinder

15. What is the sum of the interior angles of a quadrilateral?

- a. 180° b. 270° c. 360° d. 540°

16. Which of these figures has four equal sides and four right angles?

- a. Rectangle b. Trapezium c. Square d. Rhombus

17. What is the primary purpose of orthographic projection?

- a. To create a realistic 3D image of an object
b. To represent a 3D object accurately in 2D views
c. To add artistic effects to a drawing

d. To simplify an object into a single view

18. Which field commonly uses orthographic projection?

- a. Medicine
- b. Engineering and architecture
- c. Music production
- d. Cooking

19. Which of the following best describes a bay window?

- a. A window that opens like a door and swings outward
- b. A large window made up of multiple panels that project outward from the main walls of a building
- a. A small rectangular window placed high on a wall
- d. A window designed specifically for basements

20. What is the main purpose of a revolving door in buildings?

- a. To increase the amount of natural light entering the building
- b. To serve as an emergency exit
- c. To allow people to enter and exit while minimizing air exchange between inside and outside
- d. To enhance the aesthetic look of the main entrance only

21. Which of the following best describes a spiral staircase?

- a. A staircase that moves between floors in a straight line
- b. A staircase with steps arranged around a central pole, forming a helical shape
- c. A wide staircase usually found at the main entrance of a building
- d. A staircase hidden inside the walls of a building

22. What is the primary purpose of using winders in a staircase?

- a. To increase the width of each step
- b. To create a decorative element in the staircase
- c. To allow the staircase to change direction without a landing
- d. To reduce the overall height of the staircase

23. Which of the following is not typically included in a residential house plan?

- a. Floor plan
- b. Electrical layout
- c. Structural layout
- d. Vehicle registration details

24. What does the elevation drawing of a house typically show?

- a. The internal furniture layout of the house
- b. The view of the house from one side, showing height and exterior design
- c. The electrical wiring system inside the house
- d. The underground plumbing system

25. What does a section drawing of a building represent?

- a. The exterior appearance of the building from the front
- b. A horizontal cut showing the floor layout
- c. A vertical cut through the building to show internal components and structure
- d. The placement of electrical circuits in each room

True Answer

1.	c	2.	b	3.	b	4.	b
5.	a	6.	c	7.	b	8.	c
9.	b	10.	d	11.	b	12.	a
13.	b	14.	c	15.	c	16.	c
17.	b	18.	b	19.	b	20.	c
21.	b	22.	c	23.	d	24.	b
25.	c						

Module No. 4	Perform Basic Computer Operations
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Learning Outcomes:

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

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

Learning Unit 4.1	Configure Computer System
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Learning Outcomes:

After completion of this Learning unit trainee will be able to:

- Connect computer components and peripherals as per requirements.
- Install Drivers and applications according to the software specification.
- Troubleshoot Applications to trace and fix faults

4.1.1 Basic Computer Components and peripherals

A peripheral is a device that connects to a computer to input or output information, like a mouse, keyboard, scanner, or webcam. This unit covers common peripheral devices and communication ports.

Any computer system includes following:

Computer Components (Internal)

- **Motherboard:** The main circuit board that connects all the components.
- **CPU (Central Processing Unit):** The “brain” of the computer, responsible for executing instructions.
- **RAM (Random Access Memory):** Temporary storage for data and programs currently in use.
- **GPU (Graphics Processing Unit):** Handles the processing of graphics and video output.
- **Storage Devices (Hard Disk Drive/Solid State Drive):** Stores data permanently.
- **Power Supply:** Converts AC power from the wall to DC power for the computer.

Remember

Computer is an electronic machine that accepts the instruction in the form of Input and after process gives us information in the form of Output.

Computer Peripheral (External)

A computer peripheral device is an external device that provides input and output for the computer.

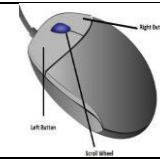
There are four types of peripherals (External) devices:

Input Devices:

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

Do You Know

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

Mouse: Used for controlling the cursor and interacting with the screen.	
Keyboard: Used for entering text and commands. There are many types of keys on the keyboard like, Numeric Keys, Alphabet Keys and Function Keys.	
Scanner: Used for converting physical documents into digital images.	

Webcams: Used for capturing video and audio.	
Microphones: Used for inputting audio.	
Joysticks and Gamepads: Used for playing video games.	
Touchscreens: Allow for direct interaction with the display.	

Output Devices

Everything that we receive after processing is known as output. Some common output devices include:

Monitor: It is an output device used to visually display information. 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.	
Printer: It produces physical copies of digital documents/images/photos	
Projectors: Project images onto a screen	
Speakers: Output Audio	
Plotter: Plotter is an output device similar to a printer but prints large-scale printing	

Storage Devices:

Hard Disk Drives (HDDs): Store data persistently.

Solid State Drives (SSDs): Similar to HDDs, but use flash memory for faster performance.

USB Flash Drives: Portable storage devices.

External Hard Drives: Larger capacity storage devices for backing up data.

Optical Drives (CD/DVD/Blu-ray): Read and write data on optical media.

Networking Devices:

- **Modems:** Connect to the internet.
- **Network Interface Cards (NICs):** Allow computers to connect to a network.

- **Routers:** Manage network traffic.
- **Wireless Adapters:** Allow computers to connect to wireless networks.

Different Types of Communication Ports:

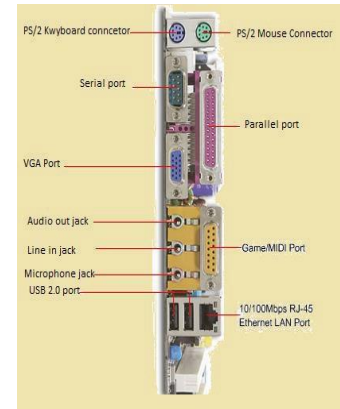
In computer hardware, a **port** serves as an interface between the computer and other computers or peripheral devices. A port generally refers to the female part of connection. Computer ports have many uses, to connect a monitor, webcam, speakers, or other peripheral devices. These **ports** are connection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

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

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

Remember

Communication ports are the gateway for data between devices and computers



Serial Ports:

A serial port is a communication gateway that transfers data one bit at a time. It was widely used for connecting computers to peripheral devices but has now been replaced by USB ports. The serial port, also known as the COM port, appears in the device manager as COM1 or COM2 when a device is connected

USB Port:

USB port (Universal Serial Bus) is the most usable connection point for data transfer in the world.

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.

VGA Port:

The **VGA** port is used for connecting a computer to a monitor. It was the replacement of MDA, CGA and EGA standards. VGA monitors compatible with 640×480 resolution.

E-SATA Port:

E-SATA is a connection for external storage devices, combining the functions of e-SATA and USB ports in one connector. It connects devices like hard drives and optical drives to a computer, supplying power at 5V and 12V.

4.1.2 Install System Software and Application Software

Computer consists of two main parts Hardware and Software.

Hardware and Software:

Following are the two major elements of the computer.

Hardware:

Hardware refers to the physical components of a computer that can be seen or touched, including the casing, monitor, keyboard, and mouse. It also includes internal parts like the hard drive, motherboard, video card, and LAN card.

Software:

Do You Know

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



Software refers to the instructions given to a computer to perform tasks. It directs the computer's processor to carry out specific operations. The two main types of software are system software and application 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** performs specific task which includes word processing software, spreadsheet software, database software, education software, entertainment software and many more.

MS- Office: Microsoft Office, includes programs like Word, Excel, Access, and Outlook, commonly used in offices. You can either buy a copy of MS Office for your computer or subscribe to its cloud-based version.

Google Docs: Google Docs is a free web-based application for creating, editing, and storing documents and spreadsheets online. Files can be accessed from any computer with an internet connection and a web browser. It is part of a larger suite of online tools offered by 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.

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.

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

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

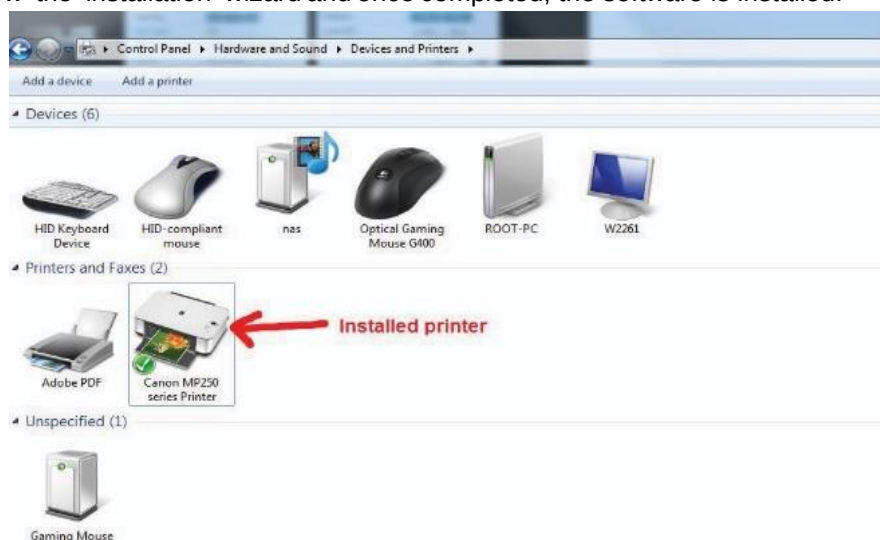
Connect the printer to the computer either using a USB cable, parallel port cable, or SCSI cable and then connect the power plug to a power outlet.

Setup printer and install software:

- After everything has been plugged in turn the computer on.
- 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.
- If you have downloaded the drivers, run the downloaded **setup file**.
- Follow the installation wizard and once completed, the software is installed.

Do you Know

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



Installing a Scanner

To install a scanner and make it ready for use, follow these simple steps:

Turn on the Scanner: Ensure that your scanner is powered on.

Connect the Scanner: Plug the scanner into the computer's USB port. If it is Plug and Play-enabled, Windows will automatically detect and install the necessary driver.

Driver Installation:

If Windows does not automatically install the driver, you may need to use the installation CD that came with the scanner. Insert the CD into your computer's CD drive.

If you don't have a CD, Windows will attempt to find and download the driver from the internet.

Follow the Wizard:

When the "Found New Hardware" message appears, click **Yes** (this time only), then click **Next**.

Follow the on-screen prompts to proceed with the installation. If prompted, select the **Add Device** option from the Start menu's search bar, click **Next**, and proceed to the Scanner and Camera Installation Wizard.

Select Scanner Model:

In the Scanner and Camera Installation Wizard, select the scanner's **manufacturer** from the list on the left, then choose the model on the right.

If you have a manufacturer's disc (CD or DVD), follow the instructions based on that. If not, Windows will help download the necessary software from the internet.

Complete the Installation:

Once the installation is complete, click **Finish** to close the wizard.

Ready to Use: Your scanner is now installed and ready for use.



Installing Scanner

Uninstalling a computer Software

To properly uninstall a program, use its provided uninstall option to remove all files and registry data. Simply deleting its icon or folder can cause conflicts and issues later.

Procedure for Un-Installing A Software

Click on **start** button.

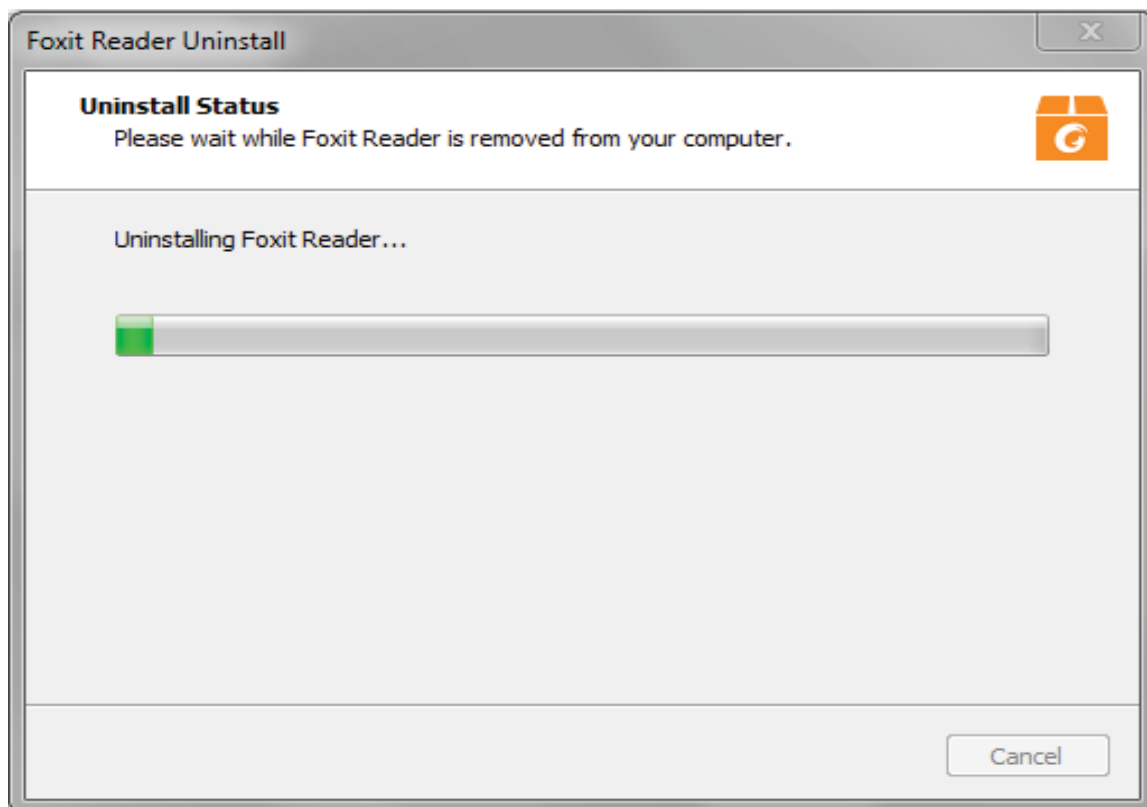
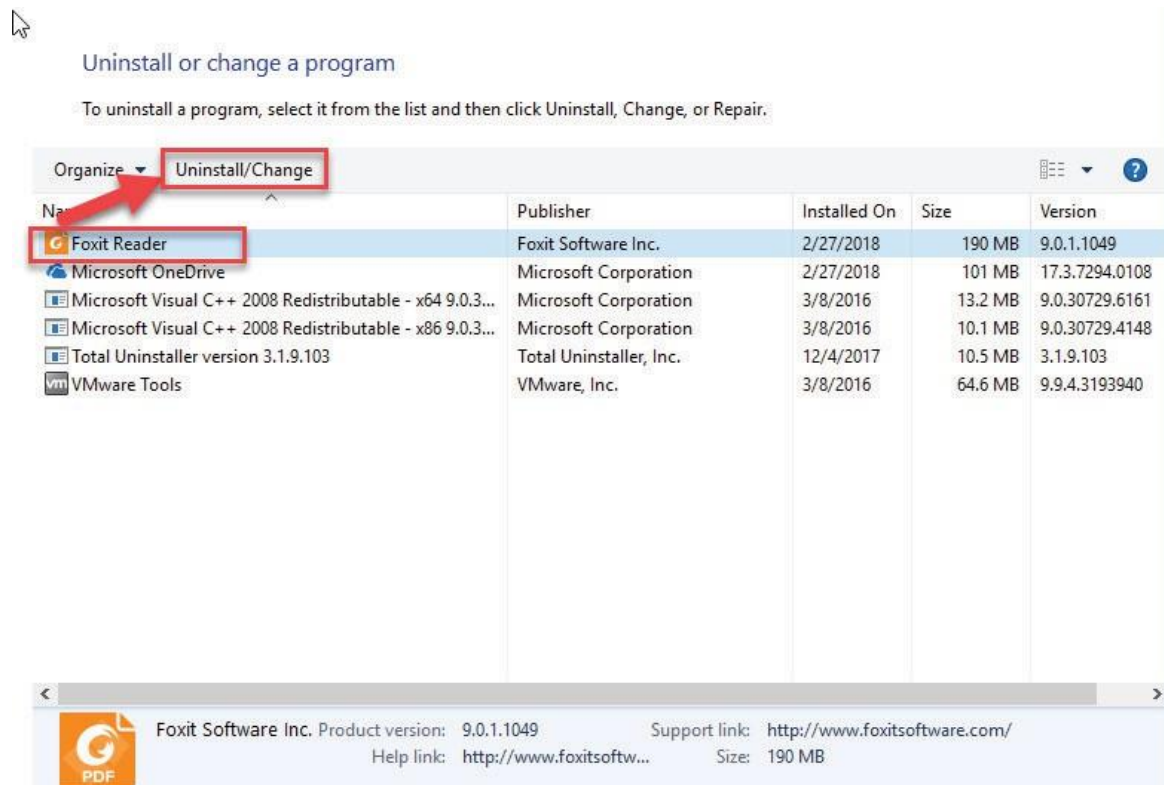
Click on control panel.

Click on programs and features.

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

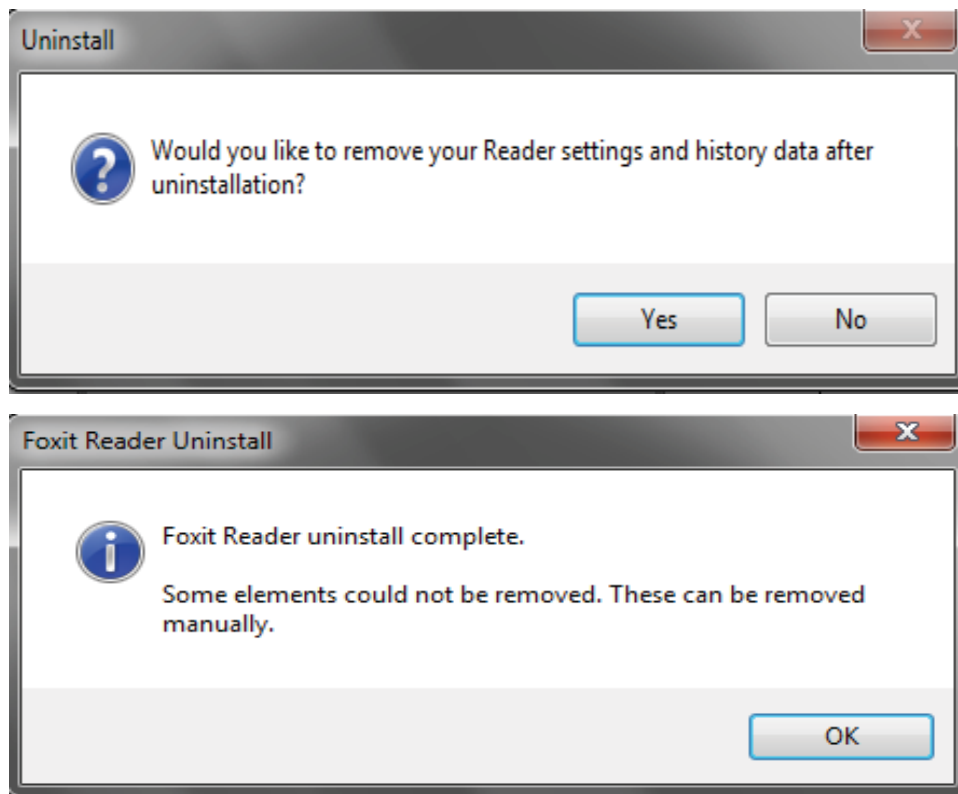
A dialogue box will appear for uninstallation.



Completing uninstalling a software

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

- Click on Yes.
- Then click on OK.



4.1.3 Process of Troubleshooting of Application Software

Software troubleshooting involves identifying, diagnosing, and fixing errors or bugs in software. This unit covers common software issues like bugs and path corruption, along with precautions for troubleshooting.

Troubleshooting common Errors in windows:

The Control Panel has troubleshooting tools that can fix common computer problems, saving time and effort.

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.

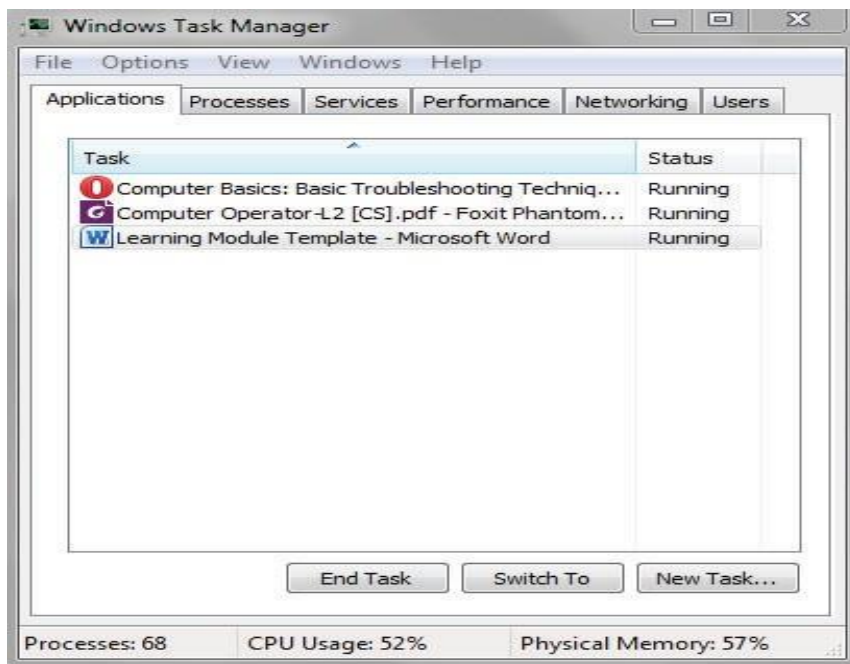
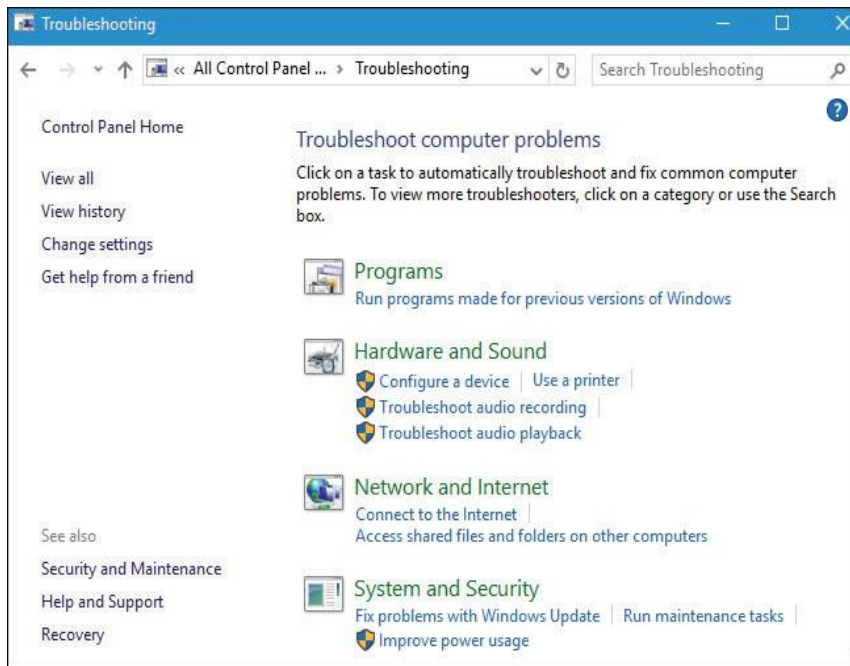
Solution 2: Update the application. To do this, click the **Help** menu and look for an option to check for **Updates**. If don't find this option, another idea is to run an online search for application updates.

Problem: An application is hanged:

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**



Activity1:

- Practice of connectivity of different cables and identify different ports.

Activity 2:

- Perform installation of OS and drivers and their trouble shooting.

Learning Unit 4.2

Prepare Document Using MS Word

Learning Outcomes:

After completion of this Learning unit trainee will be able to:

- Compose a document as per requirement.
- Format Word Document according to given requirements.
- Print Word Documents according to requirements.
- Print both sides of paper

4.2.1 Introduction

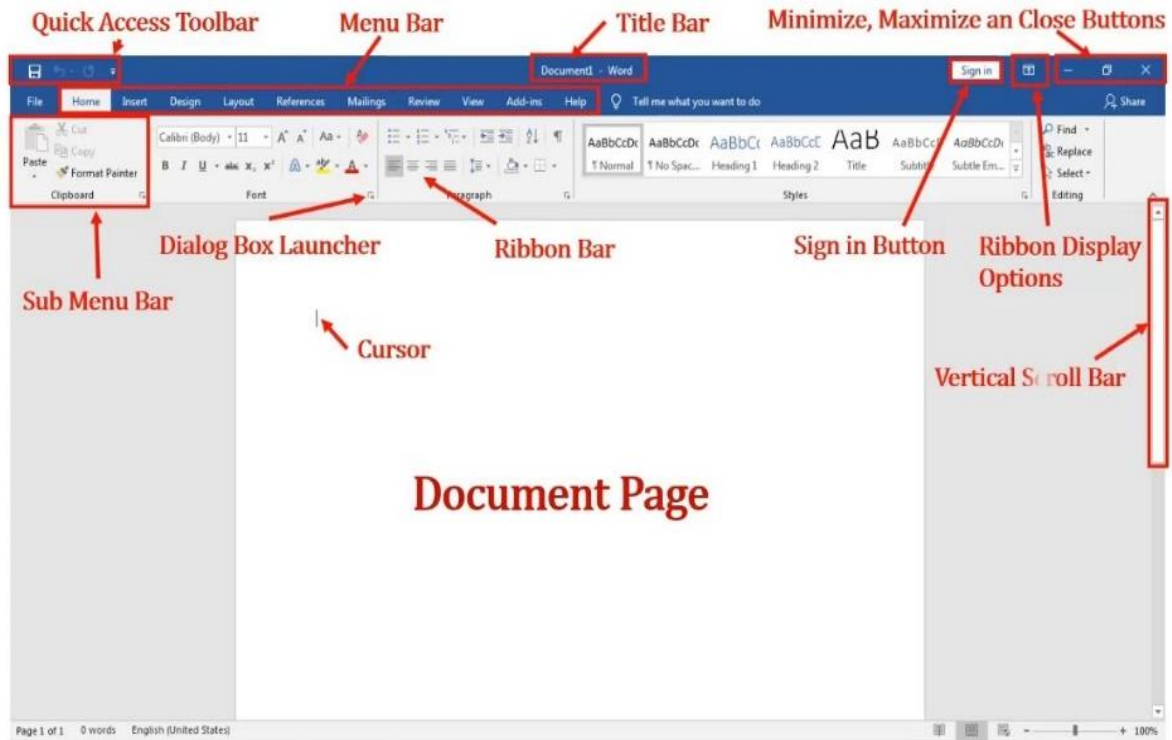
MS Word / Microsoft Word is part of the Microsoft Office. Its main function is for producing documents that includes text, graphics, table, clip art, etc.

Features of Standard Word Processor

- **File Management:** File management allow to create, delete, move, and search for files.
- **Font specifications:** It allows to change fonts within a document. For example, you can specify bold, italics, and underlining.

Do you Know

MS Word has a “Read Aloud” feature that can read your document out loud.



4.2.2 Compose Documents as per the requirements.

Formatting and modify documents.

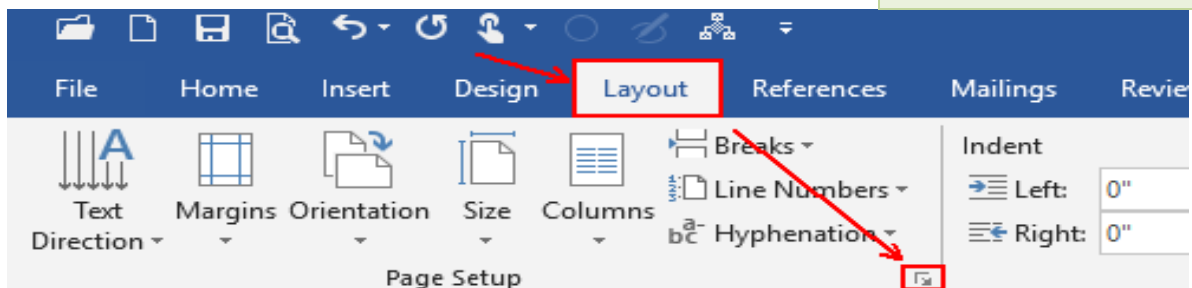
Layout

To setup a page in MS Word a **layout** tab is available in the Tabs. In 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:

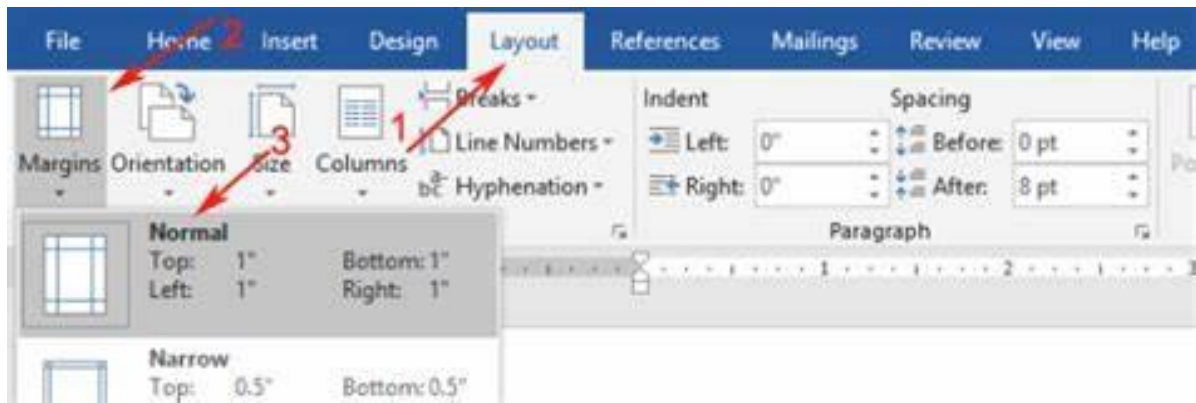
Do you Know

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



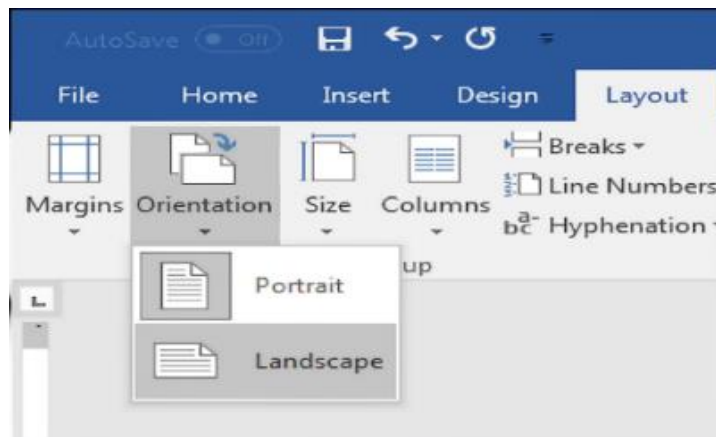
Margin:

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



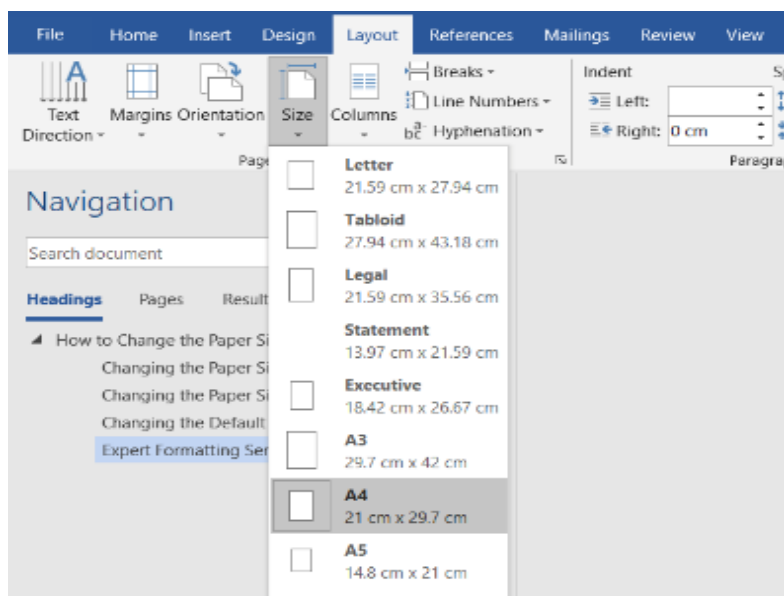
Orientation:

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.



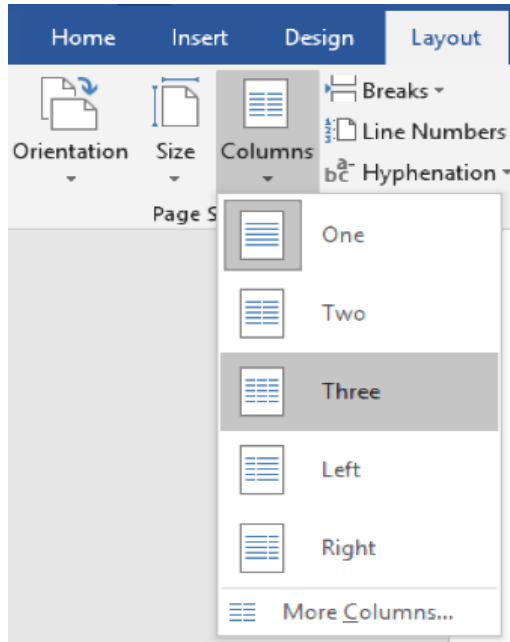
Size:

Books and magazines are printed in a variety of sizes. Different paper sizes are required to meet printing needs. Microsoft Word allows you to choose a variety of paper sizes for your documents.



Columns

Columns are used in many types of documents, but most commonly used in newspapers, magazines, academic journals, and newsletters.



Remember

Columns serves to organize or present data in a clear and understandable way.

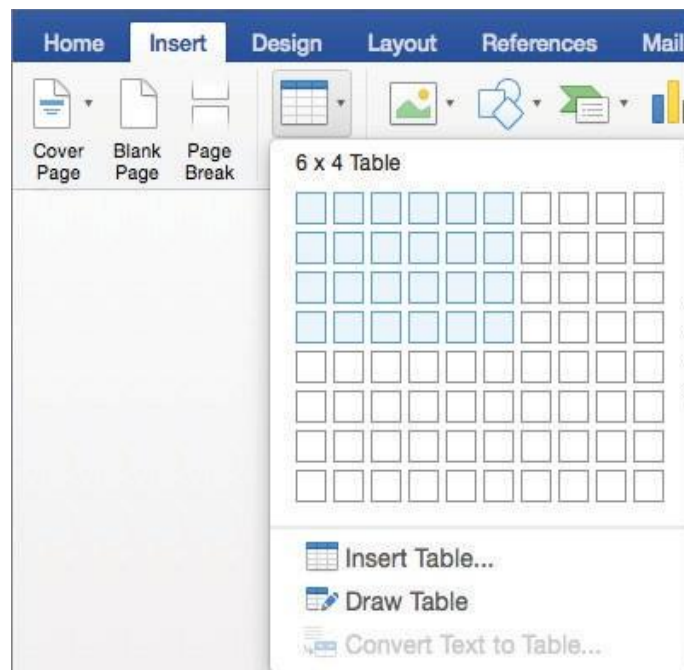
Tables:

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:

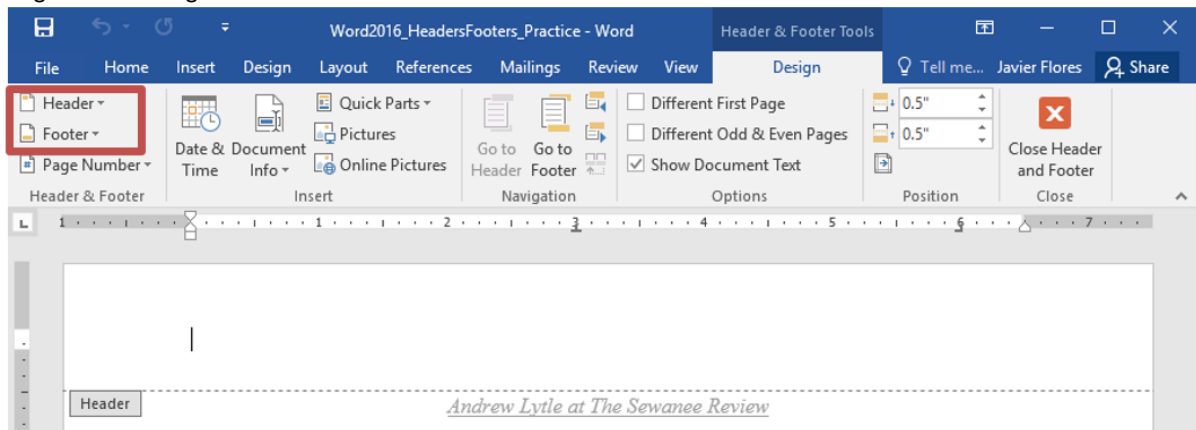
- i. Place your insertion point in the document where you want the table to appear.
- ii. Select the insert tab.
- iii. Click the table command.



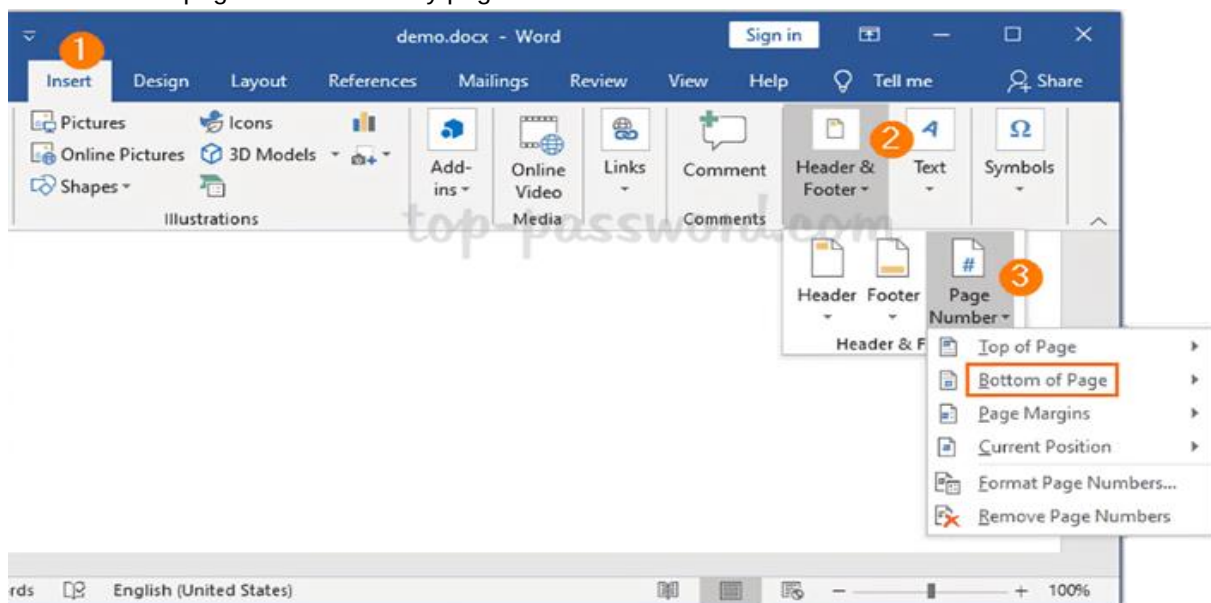
Procedure of Inserting Header and footer:

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:

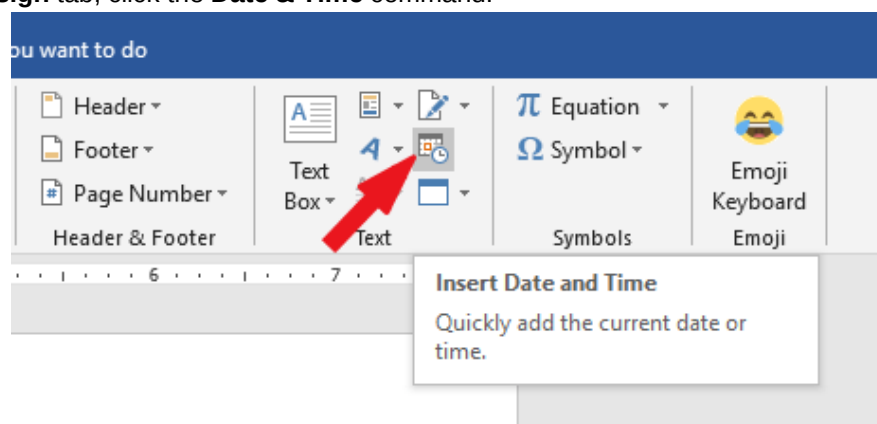
Page Numbering



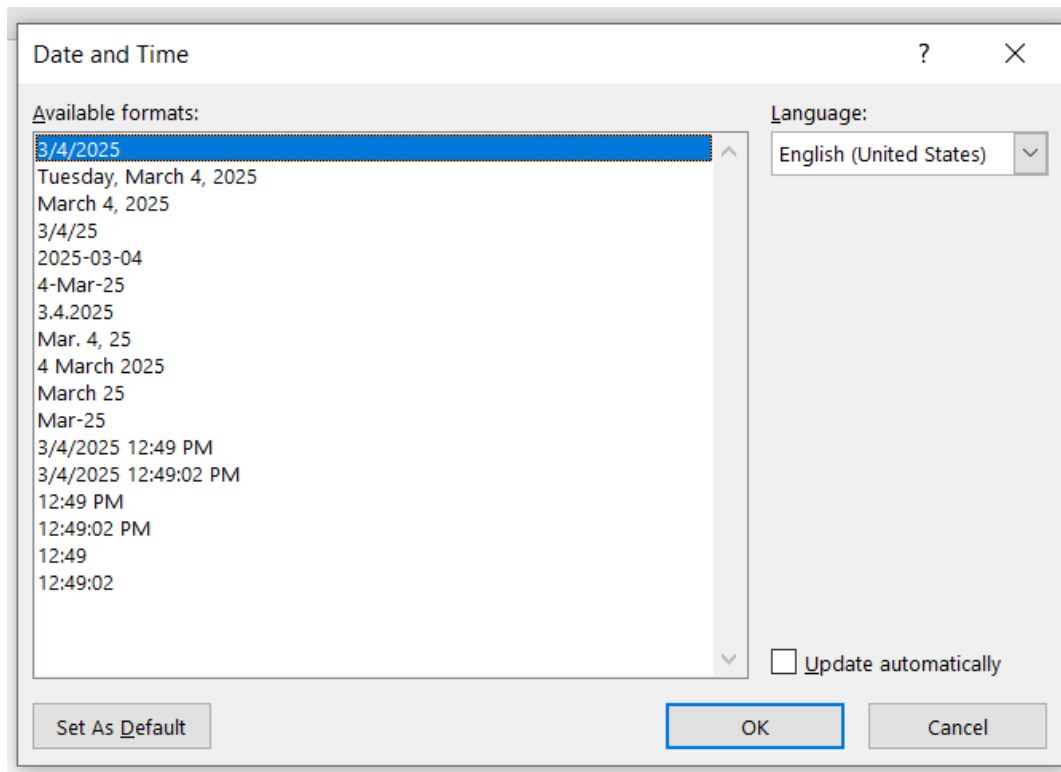
We can attach page number in every page or in footer.



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



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



Alignment

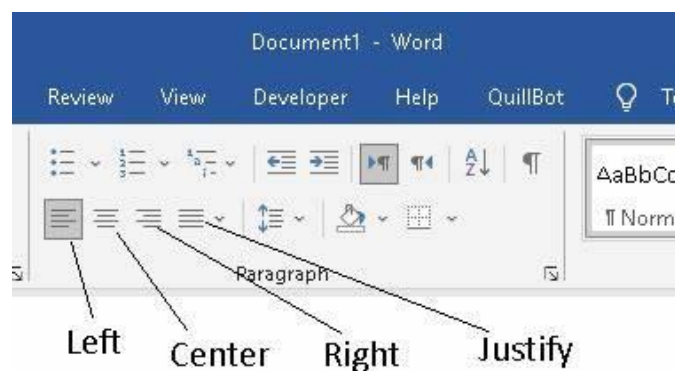
In Word, there are several options for adjusting the font of text, including size, color, and inserting special symbols. You can also adjust the alignment of the text to change how it is displayed on the page. The text formatting toolbar is given below with the options related to text formatting.

Basic Alignments

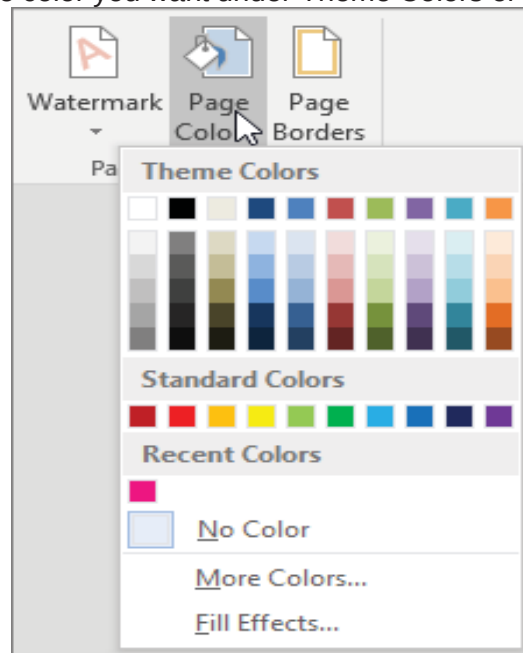
- **Left:** Aligns all selected text to the left margin
- **Center:** Aligns text an equal distance from the left and right margins
- **Right:** Aligns all selected text to the right margin
- **Justify:** Aligns text equally on both sides and lines up equally to the right and left

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.

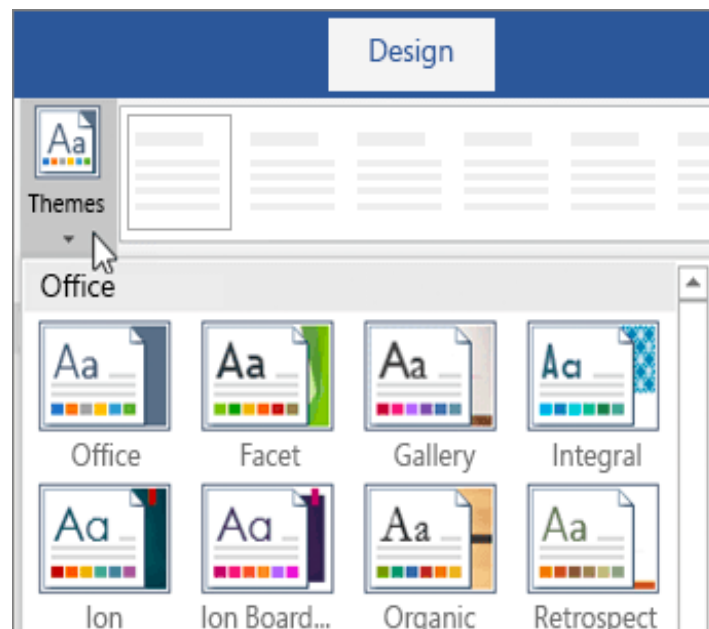


- **Change the background color**
 - i. Click Design > Page Color.
 - ii. Click the color you want under Theme Colors or Standard Colors



Themes/Style

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.

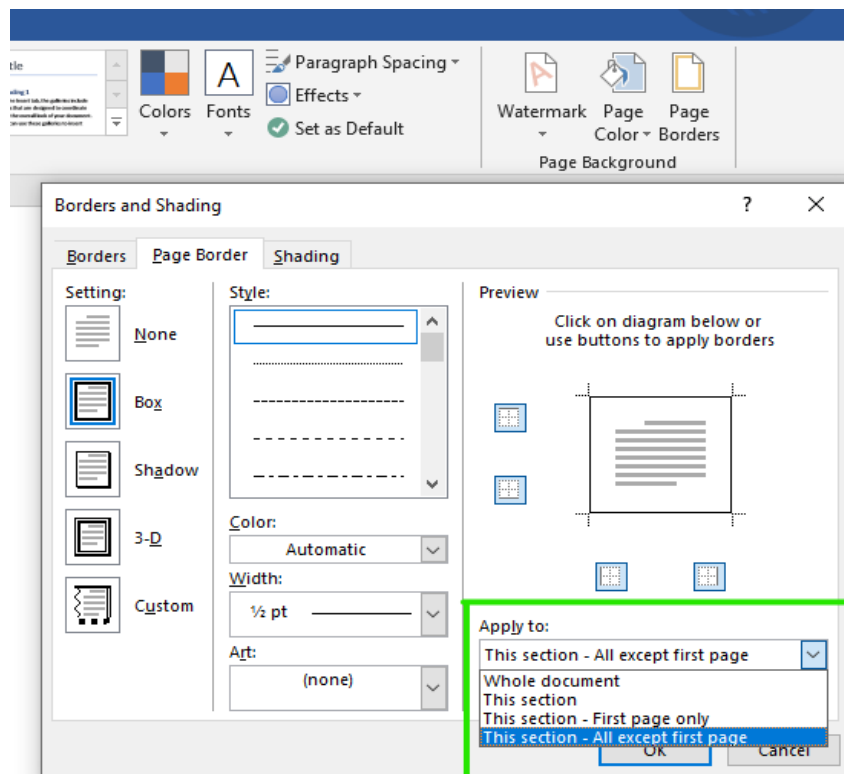


Page / Paragraph borders

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. Click on the Page Layout tab. In Word 2016 and 2019 click on the Design tab instead.
- ii. In the Page Background group, click the Page border option.
- iii. In the Borders and Shading window (shown below), click the Page Border tab.
- iv. Select Box if you want a square border around your page.

- v. 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.

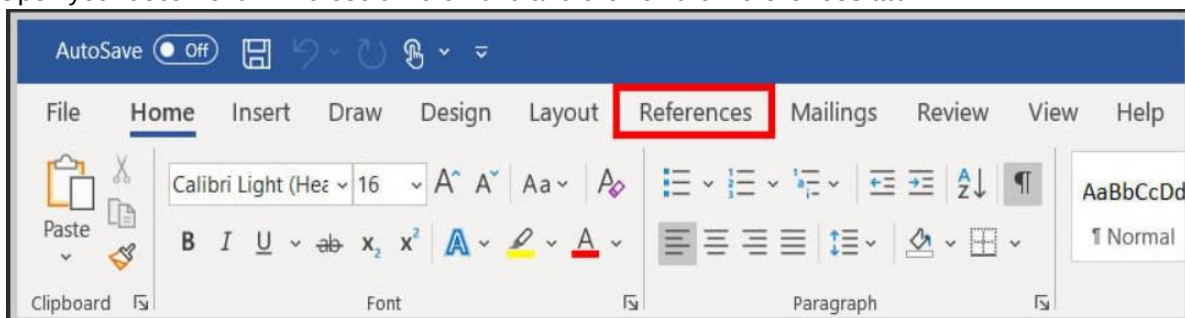


References

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

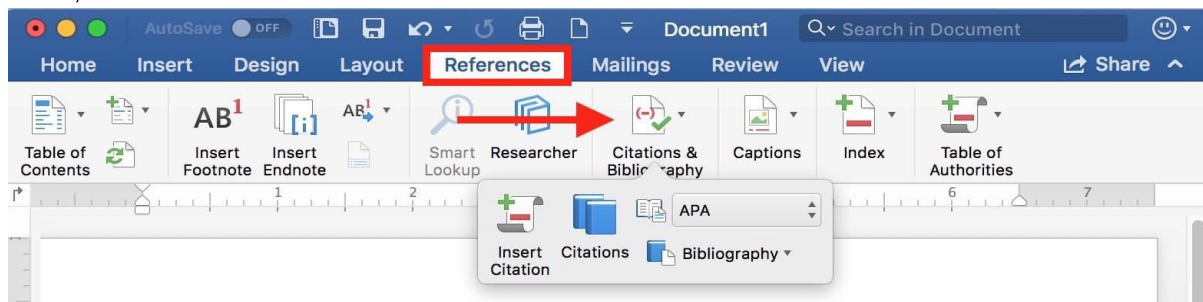
Step 1:

Open your document in Microsoft Word 2019 and click on the **References** tab.



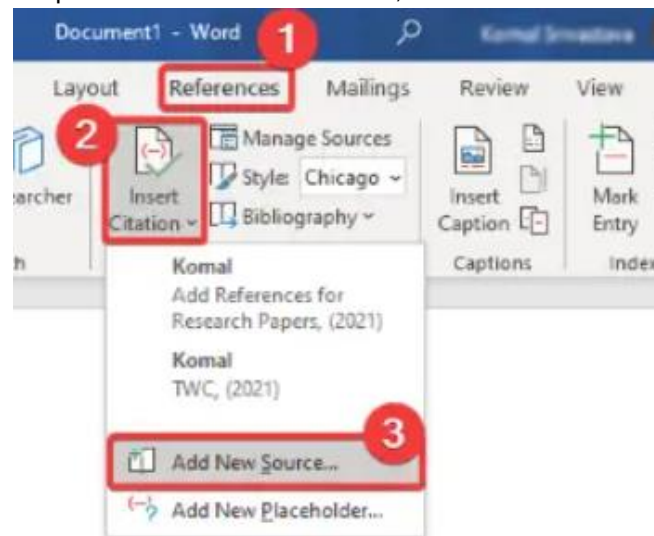
Step 2:

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



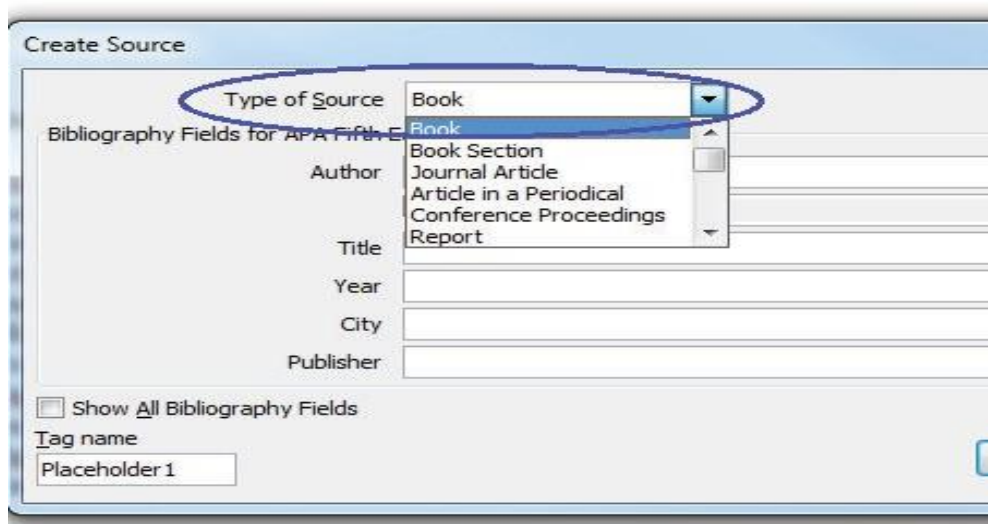
Step 3:

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.



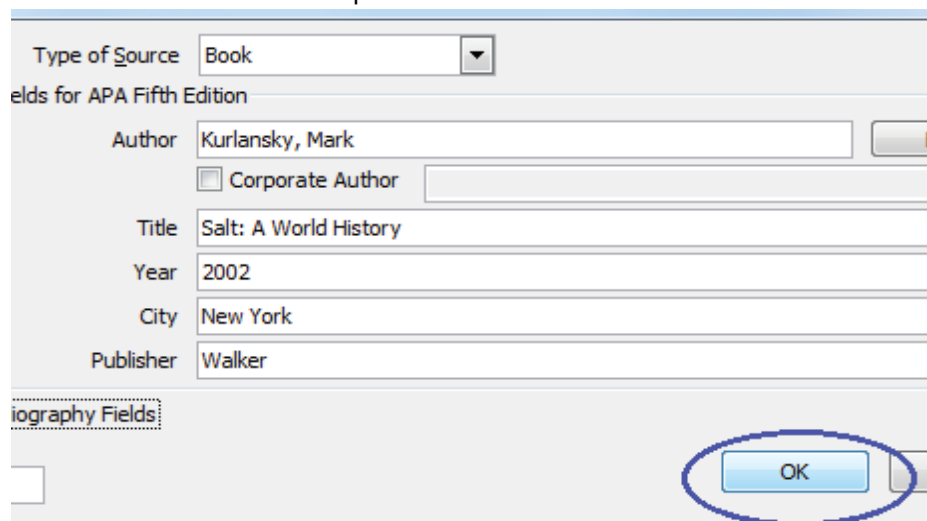
Step 4:

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



Step 5:

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



Step 6:

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

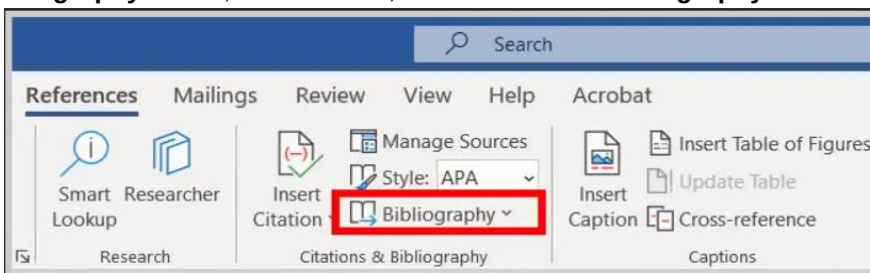
, and sentence structure. The document body and thesis
ing effective communication of the written concept from the
iring academic editing can request editors to follow any of the
icago, CSE, or MLA. Papercheck proofreading services accept
docx), Microsoft Excel Files (*xls or xlsx), Microsoft
, Portable 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.
rvice are available for web sites, emails, memos, proposals,
t, 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-
f 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
requested editing service. Our goal is to provide the best editing

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.

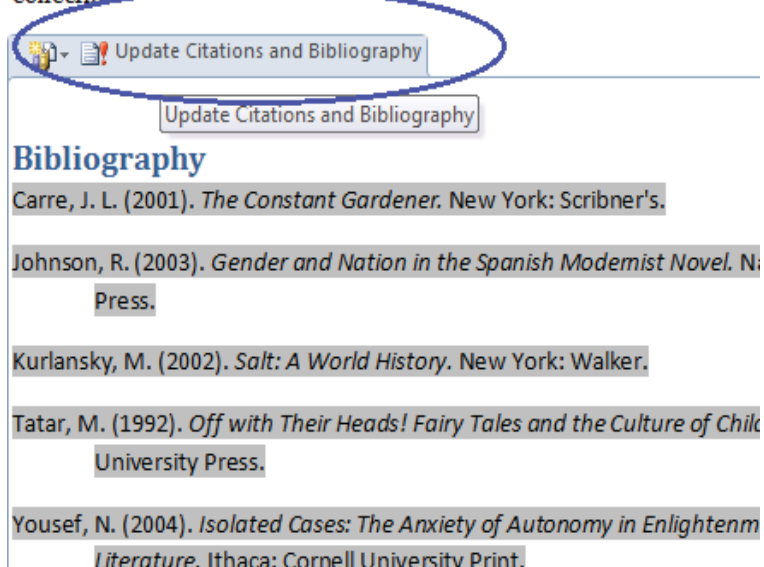
Click on the **Bibliography** button, shown below, and select either **Bibliography** or **Works Cited**.



Step 8:

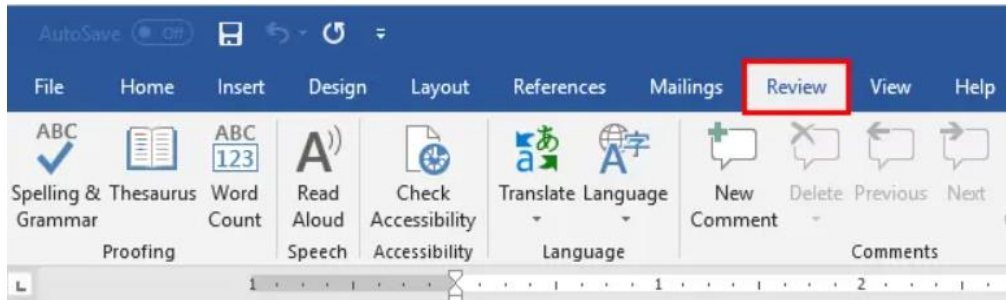
To update the bibliography after entering new sources, click anywhere on the bibliography table. Click on Update Citations and Bibliography.

info@papercheck.com. If you do not receive acknowledgment of your
satisfactorily addressed, you should then contact TRUSTe through the
Dispute Resolution Process. TRUSTe will serve as a liaison with the
concerns



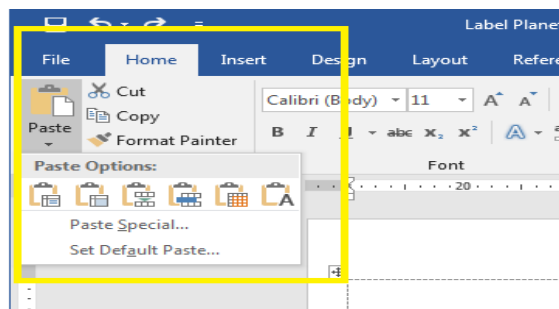
Review option

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)

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.

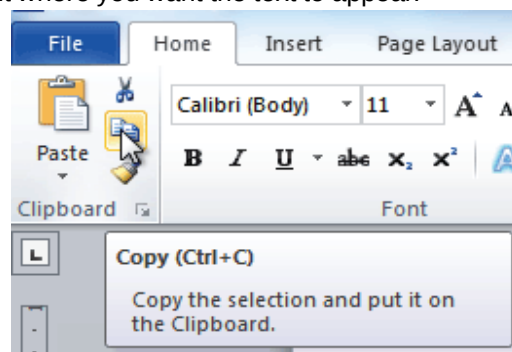
Find: Searches for specified text in the active document.

Replace: Searches for and replaces specified text and formatting.

Copying and Pasting Text

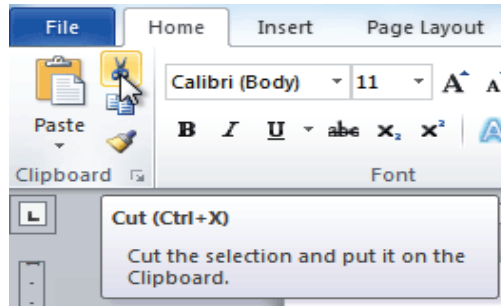
The procedure to Copy and paste the text has following steps:

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



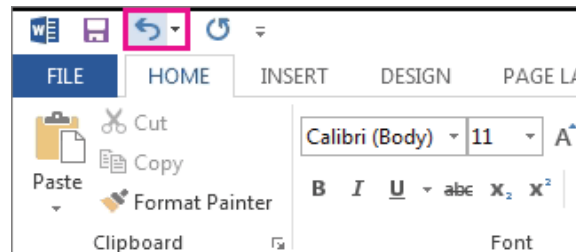
Cutting and Pasting Text

- Select the text you want to copy.
- 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 find quick access toolbar. The Undo command is activated by pressing the Ctrl+Z



Redo

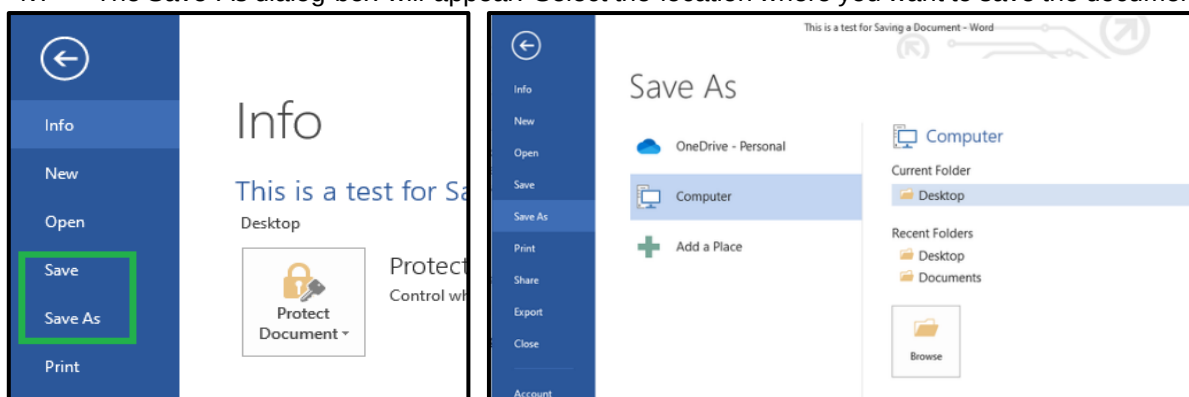
To do last one step Ctrl+Y

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.

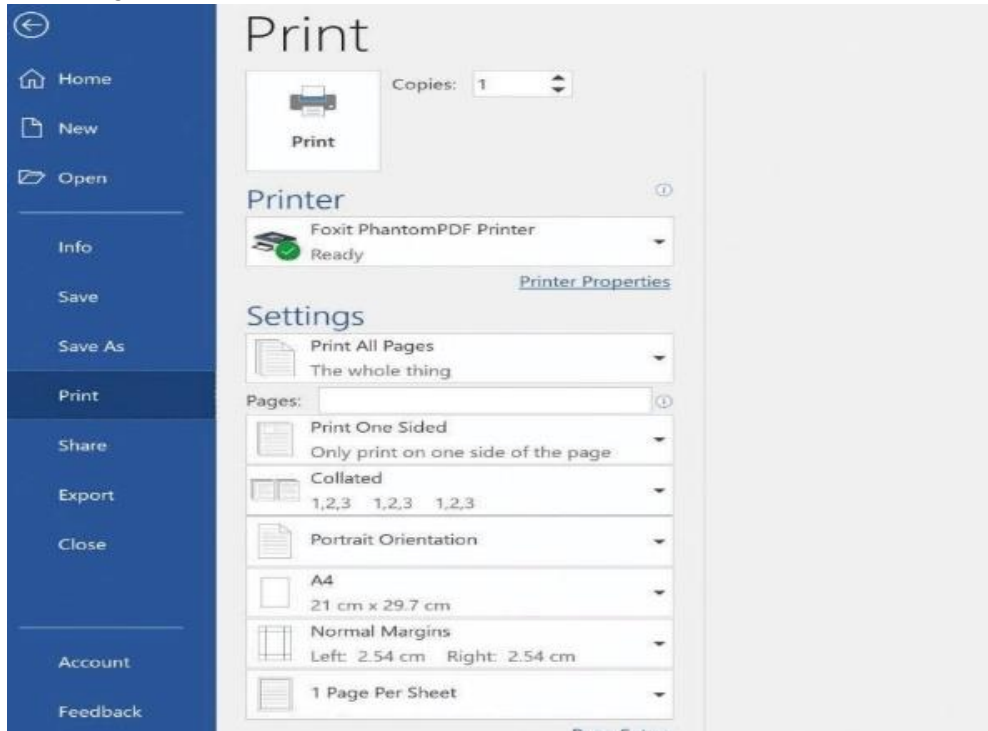
The procedure to save a word file through Save As function has the following steps:

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



4.2.3 Print Document:

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



Activity1:

Install MS Office Application correctly

Activity 2:

Practice of short keys, document opening/closing, saving, coping and pasting.

Activity 3:

Practice of creating and editing a document/letter in MS word and print it.

Create a letter in Microsoft Word, format it with proper text and paragraph settings, and make any necessary edits. After finalizing your document, you'll save it and prepare it for printing.

Learning Unit 4.3

Prepare a Worksheet Using MS Excel

Learning Outcomes:

After completion of this Learning Unit, trainee will be able to:

- Develop a worksheet as per given data.
- Format the worksheet according to given Criteria.
- Apply formula according to given Requirement.
- Generate Charts/Graphs according to the given data.

4.3.1 Introduction

Microsoft Excel 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.

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

Remember

Every workbook in MS Excel contains 3 worksheets by default.

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 number of columns is 16,384.

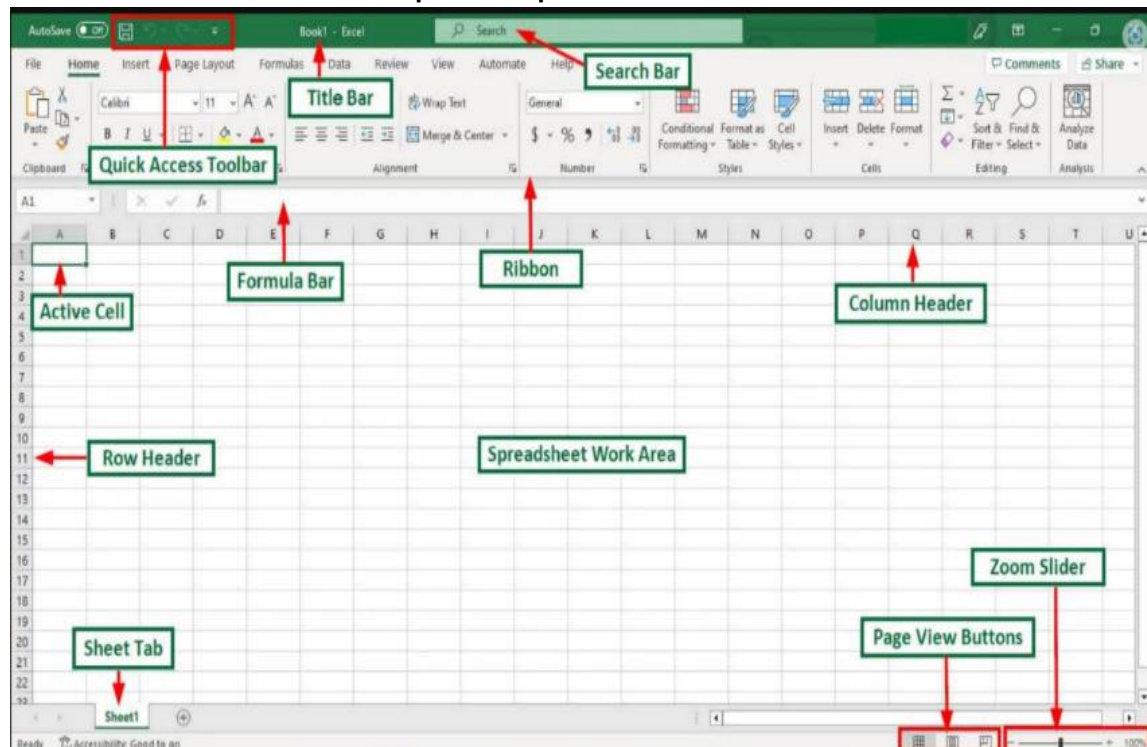
Formula: A self-made method of calculation is called formula. **Function:** A pre-defined method of calculation is called function. **Range:** A group of cells.

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

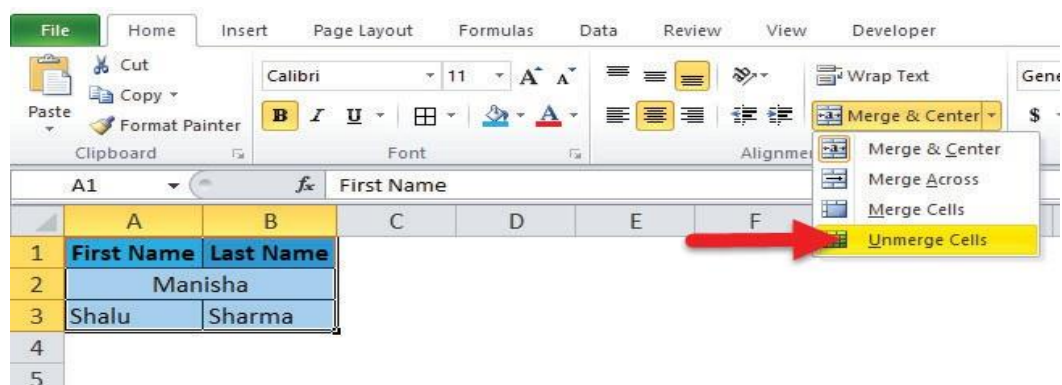
Main parts of Spreadsheet Work Area



Format Cells to Prepare the Worksheet.

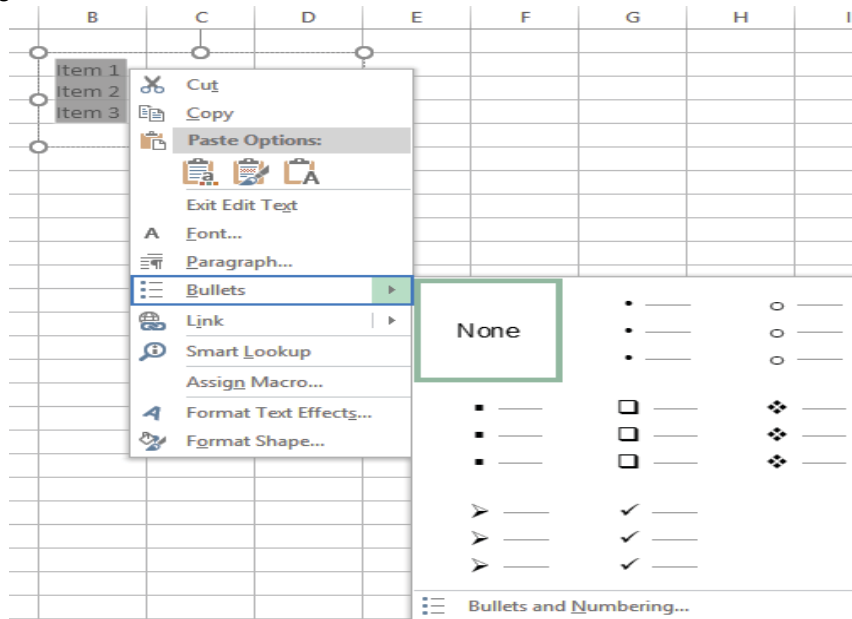
Merge and Unmerge

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.



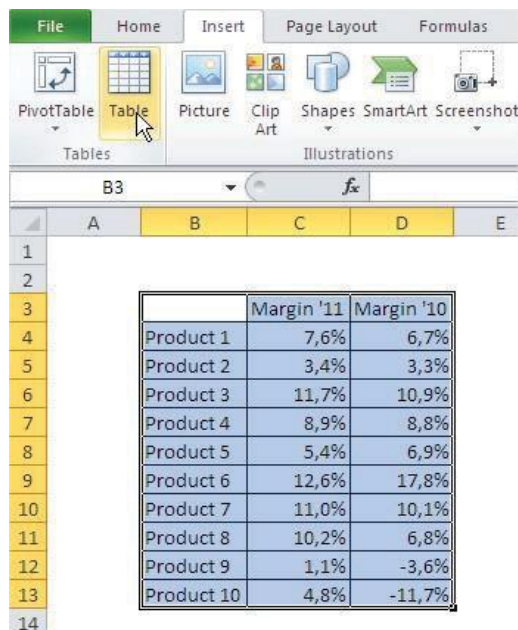
Numbering and Bullets

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.



4.3.2 Applying formulas to create functional worksheet.

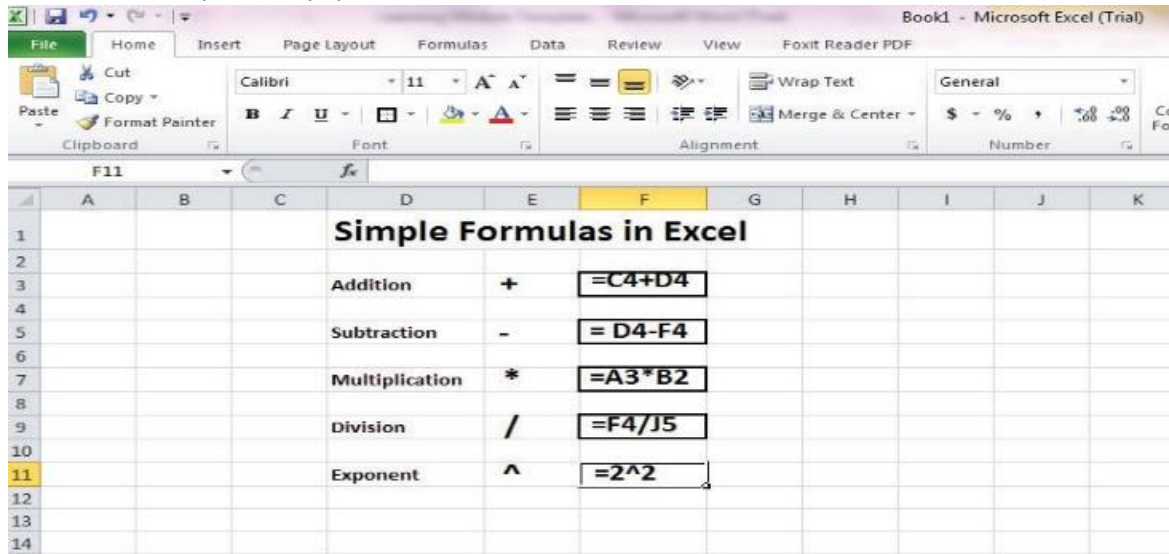
Creating Formulas

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

- A **plus sign** for addition (+)
- **Minus sign** for subtraction (-)
- **Asterisk** for multiplication (*)
- **Forward slash** for division (/)

- **Caret for exponents (^)**



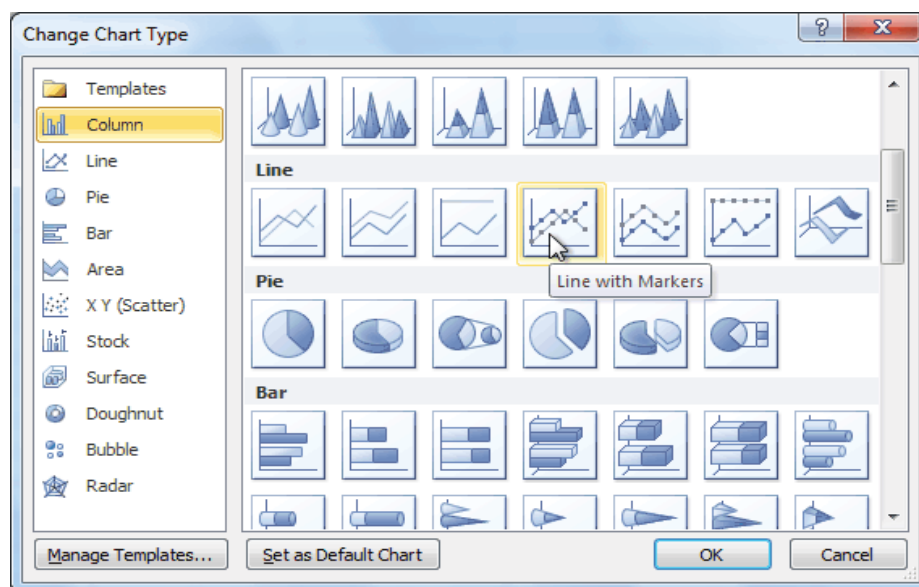
4.3.3 Create Charts/Graphs

Defining charts/Graphs.

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.

Excel Chart Type

MS Excel has different types of charts as shown in the picture below.

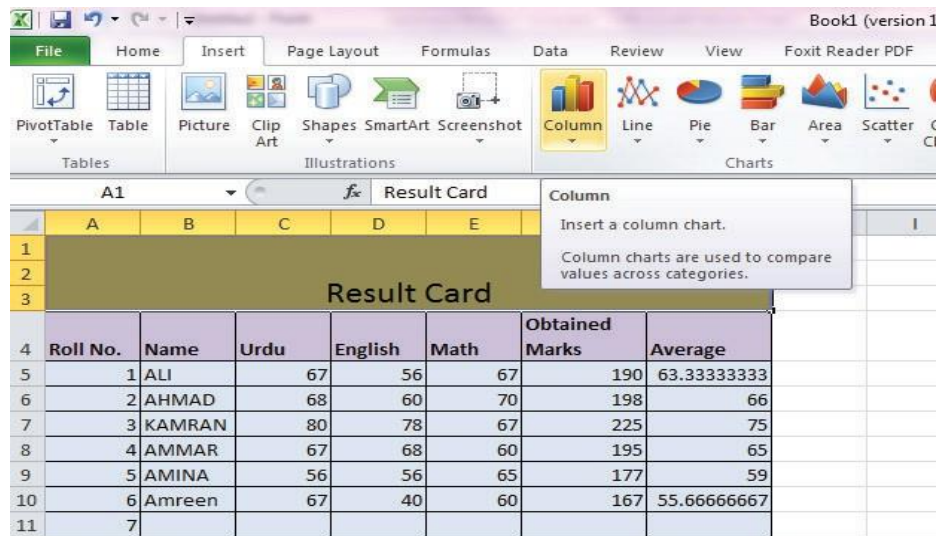


Creating a Chart in Excel

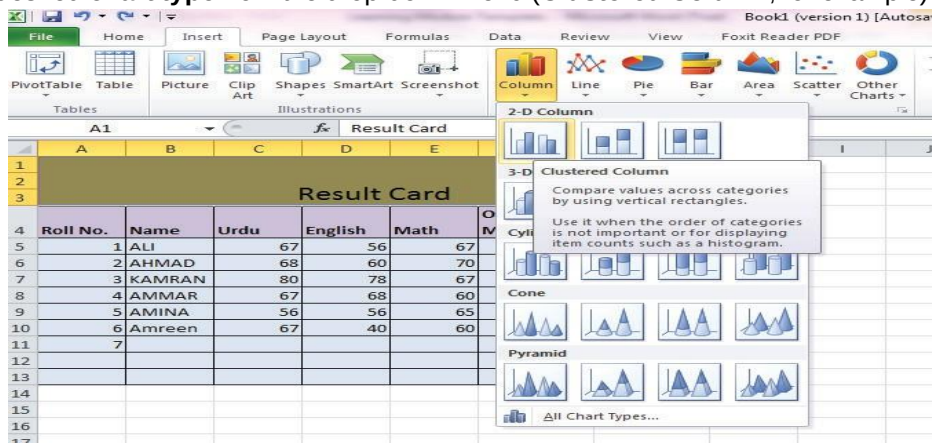
Select the **cells** that are wanted to chart, including the **column titles** and **row labels**. These cells will be the **source data** for the chart.

Click the **Insert** tab

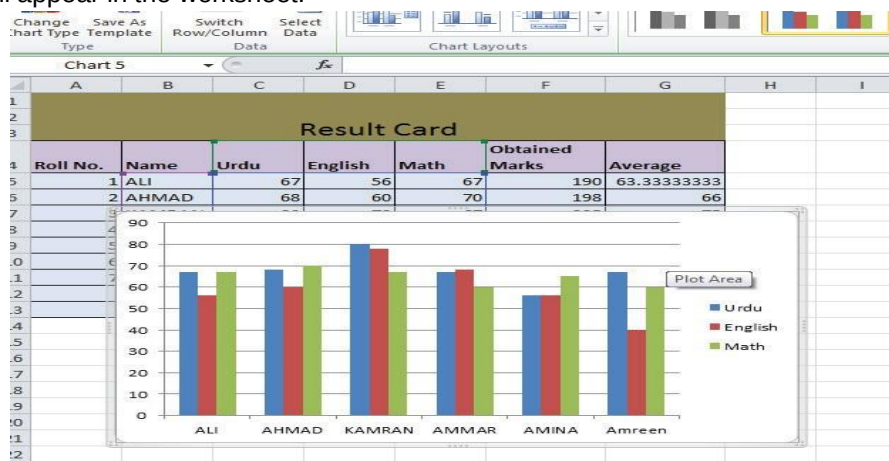
In the **Charts** group, select the desired **chart**.



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



The chart will appear in the worksheet.



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.

Activity 1:

Practice to enter data into columns and rows as per given instructions.

Solution

B9									
	A	B	C	D	E	F	G	H	I
1									
2									
3									
4									
5									
6									
7									
8									
9									

Activity 2:

Format and apply formulas to a work sheet according to the requirement.

INSTRUCTIONS

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

INTERNATIONAL 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		

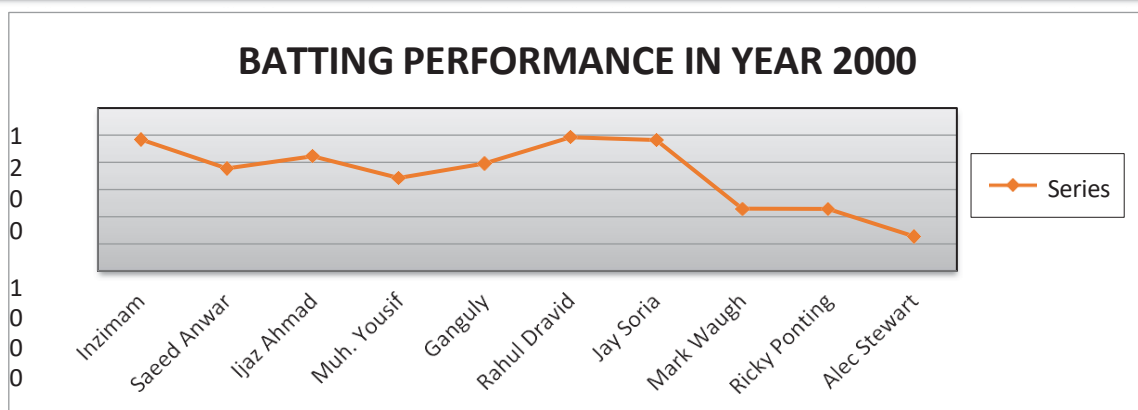
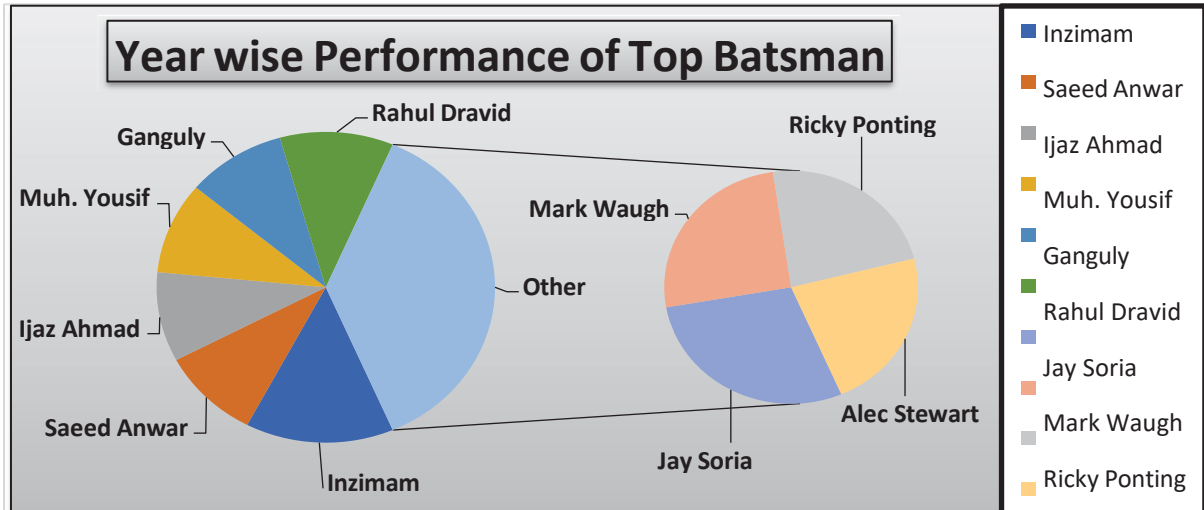
Activity3:

Set page layouts and margins.

You will adjust the page layout and set margins in your document. Start by selecting the page orientation (portrait or landscape), then choose the appropriate paper size. Afterward, set the margins to standard or custom measurements. These settings help ensure your document looks clean and professional.

Activity4:

Practice to generate chart/graph according to given data.



Learning Unit 4.4

Prepare Presentation Using MS PowerPoint

Learning Outcome

After completion of this Learning Unit, trainee 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.
- Present a presentation according to 7Cs of communication

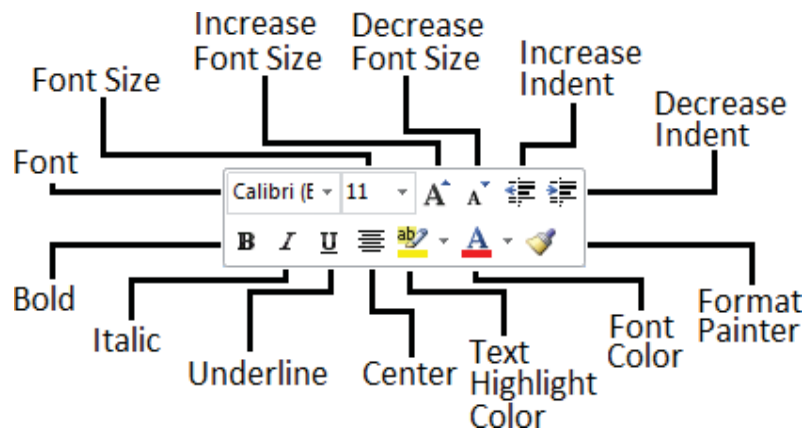
4.4.1 Introduction

A PowerPoint presentation is a group of digital slides used to share information in an easy and attractive way. Each slide can include text, pictures, charts, tables, sounds, or videos. The presentation can be shown automatically or manually controlled by the person presenting. PowerPoint presentations are often used in schools, offices, and events to explain ideas clearly. When you save a PowerPoint file, it ends with ".ppt", and it's also commonly called a PPT

4.4.2 Layout and interface of PowerPoint

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.

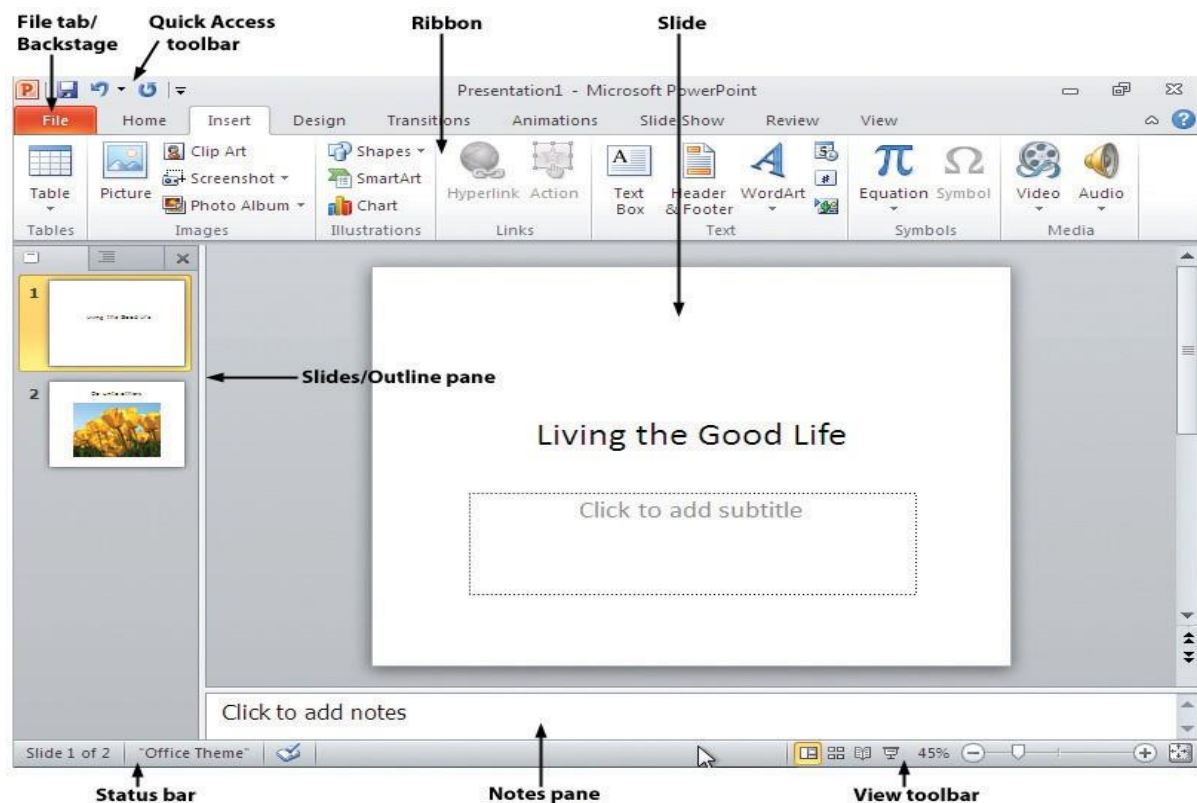


Layout of Power point

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.

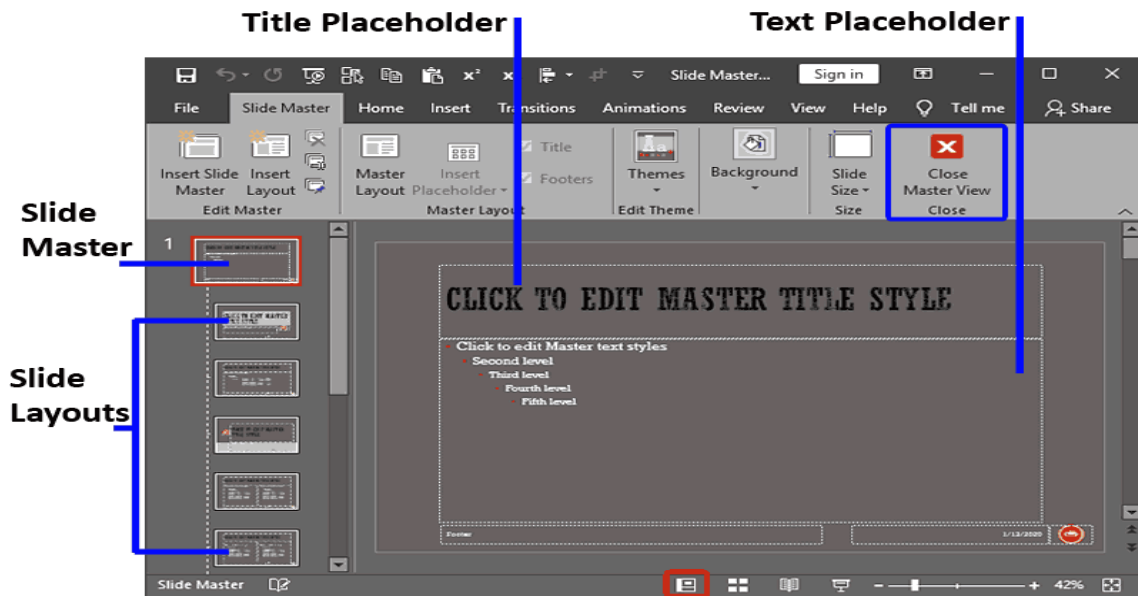
Remember

Every presentation contains at least one slide master



Slide Master

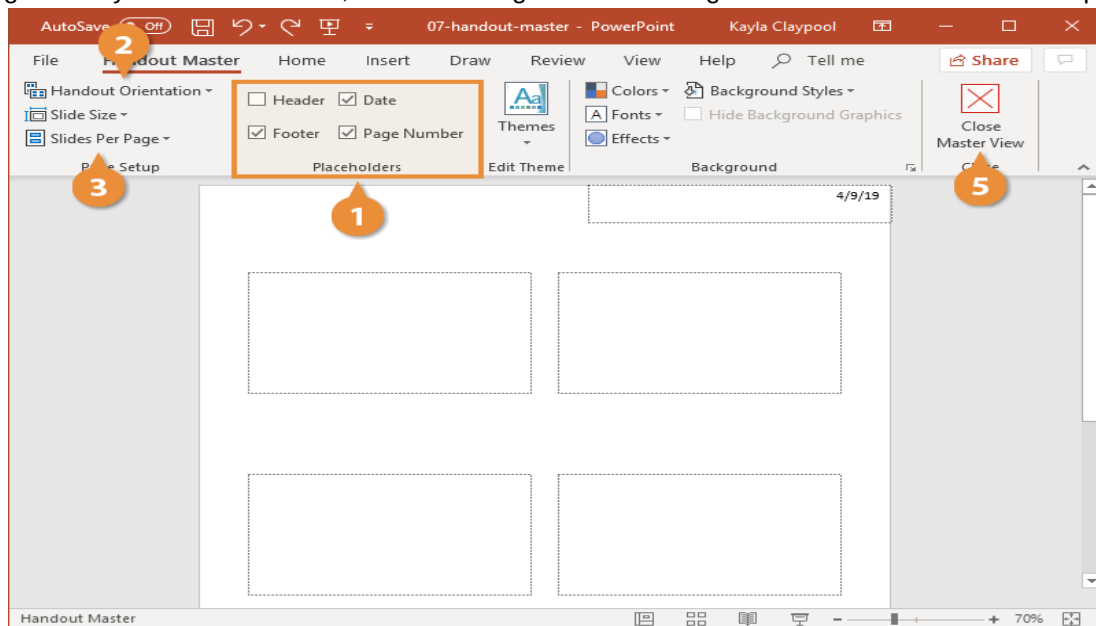
A slide master is the top slide that stores information about the theme and slide layouts of a presentation. It includes the **background, color, fonts, effects, and positioning**. By using Slide Master, affects can be added in every slide. Individual slide layouts can also be modified using this feature.



4.4.3 Slide and different layout of PowerPoint

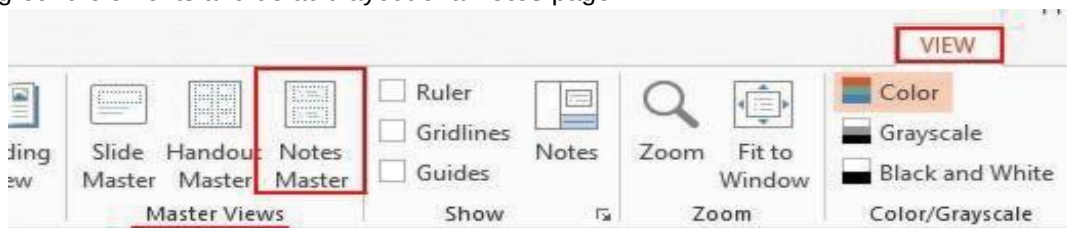
Handout Master

Handout master customizes 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.



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



4.4.4 Insert Slides with different layout.

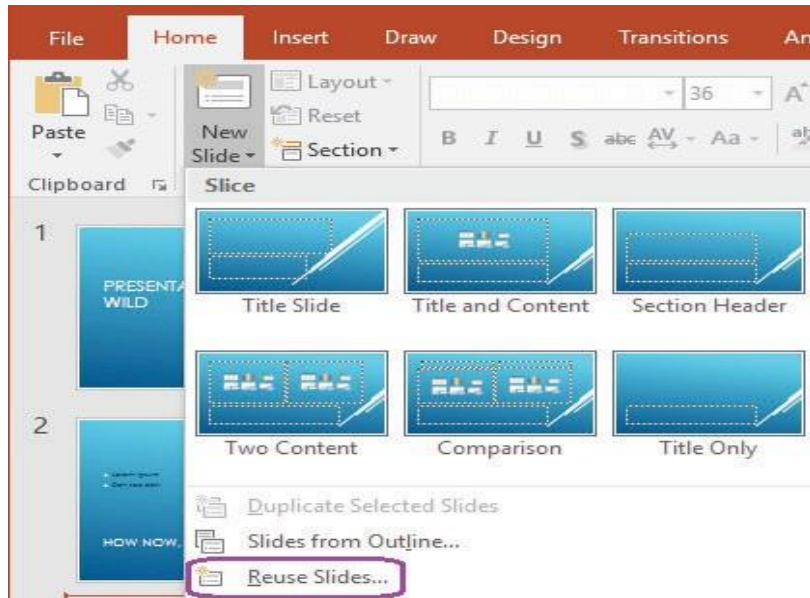
One or more slides can be added in a presentation easily

Following are the steps.

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

Remember

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



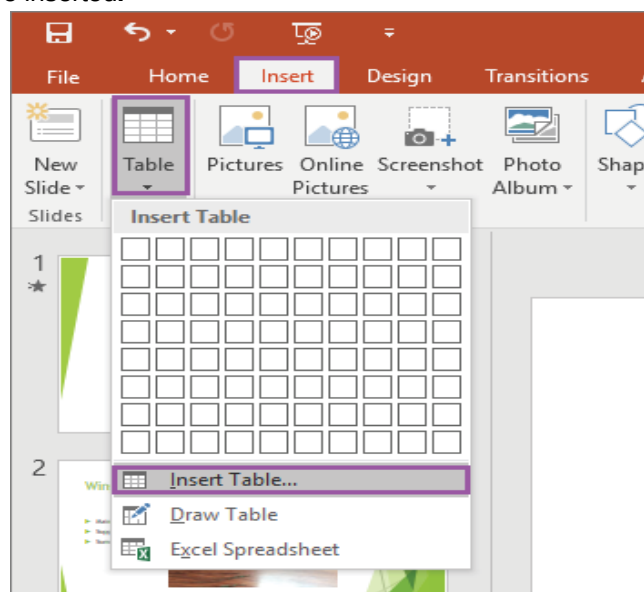
4.4.5 Insert Table picture, Picture, Text Box, Shape and Action Button.

Insert Table:

Add table in your slide

Following are the steps.

- Open MS Power point.
- Under the Insert tab.
- Click on tables
- Select the desired rows and columns
- The table will be inserted.

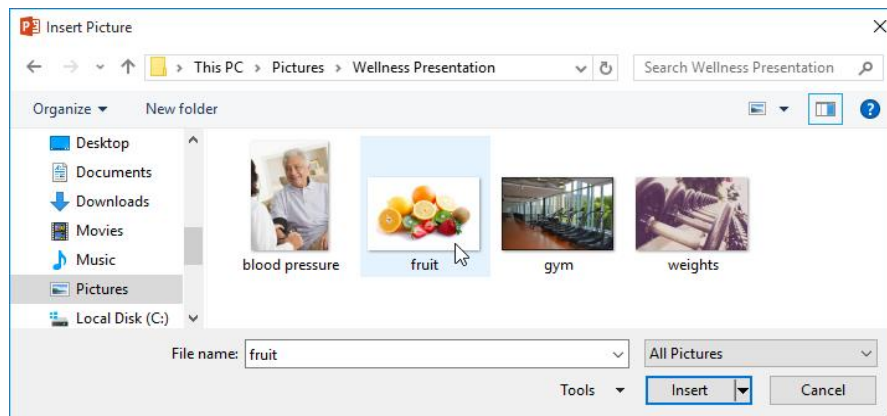
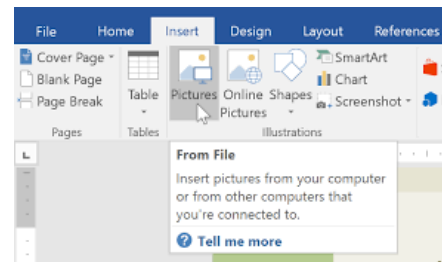


Insert Picture

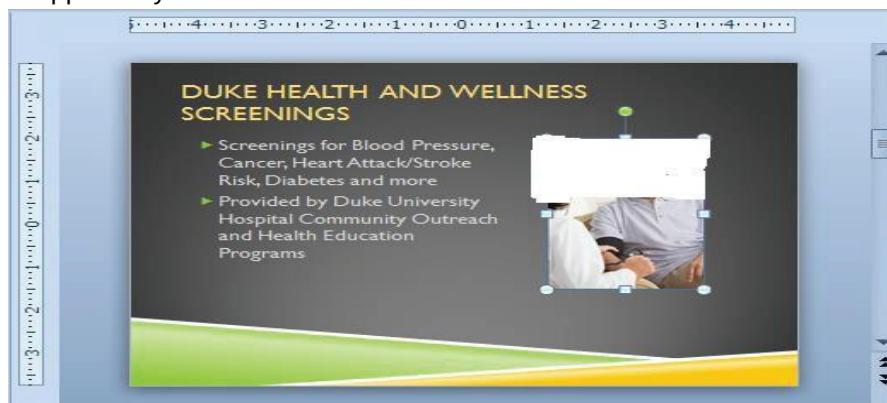
Add picture in you slide

Following are the steps.

- Open MS Power point.
- Under the Home tab.
- Click on picture
- Select the desired image file, then click inset.

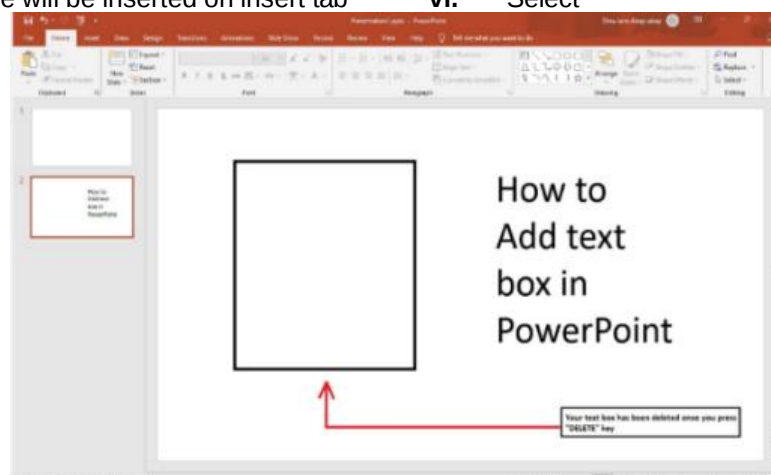


The picture will appear in your slide



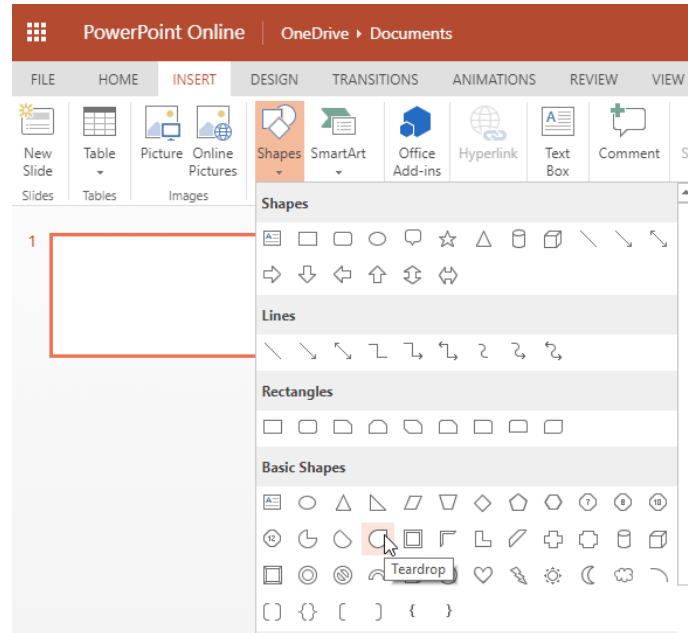
Insert Textbox

- Open MS Power point.
- Under the Insert tab.
- Click on text box
- Select the desired rows and columns
- The table will be inserted on insert tab
- Select



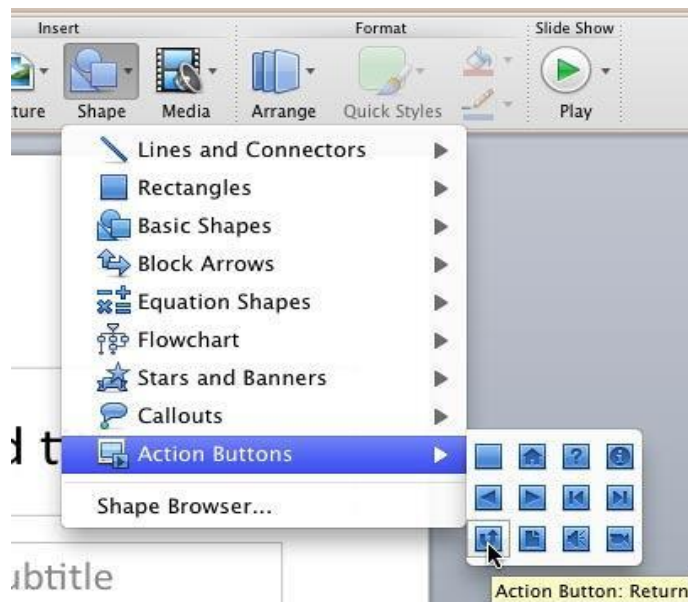
Insert Shape

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



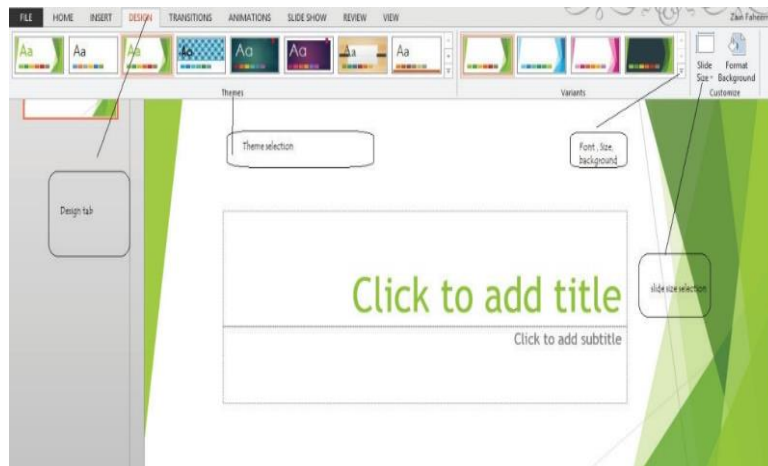
Action Button

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**.



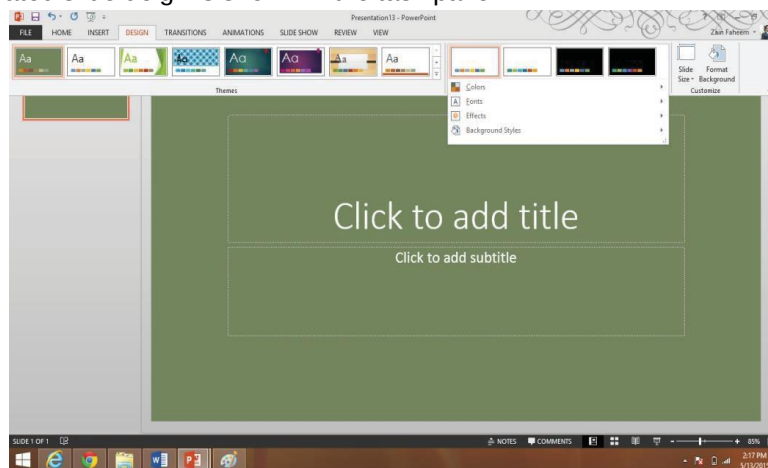
Insert Design and Backgrounds

- 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.



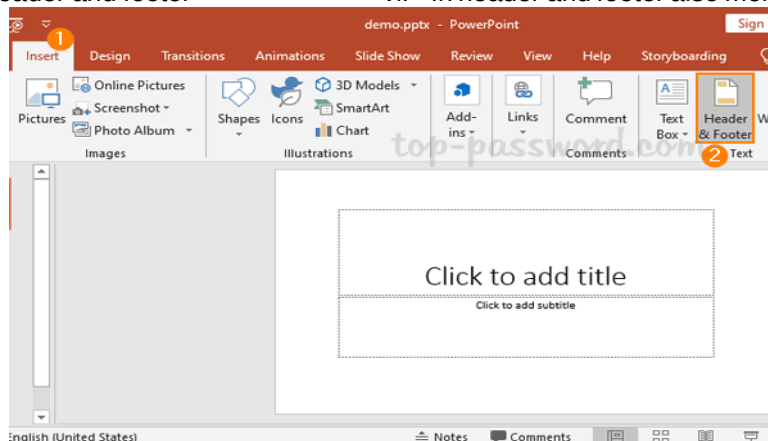
For creation of new theme select customize background option and choose on choice background form the list.

- i. Click the variant option.
- ii. Click Font and select appropriate font
- iii. Click Color and select suitable color scheme
- iv. Click Background styles and select desired background
- v. Click Effect and select appropriate effect
- vi. Click size of the Slide, it shows two options, choose one option
- vii. Newly created slide design is shown in the task pane



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



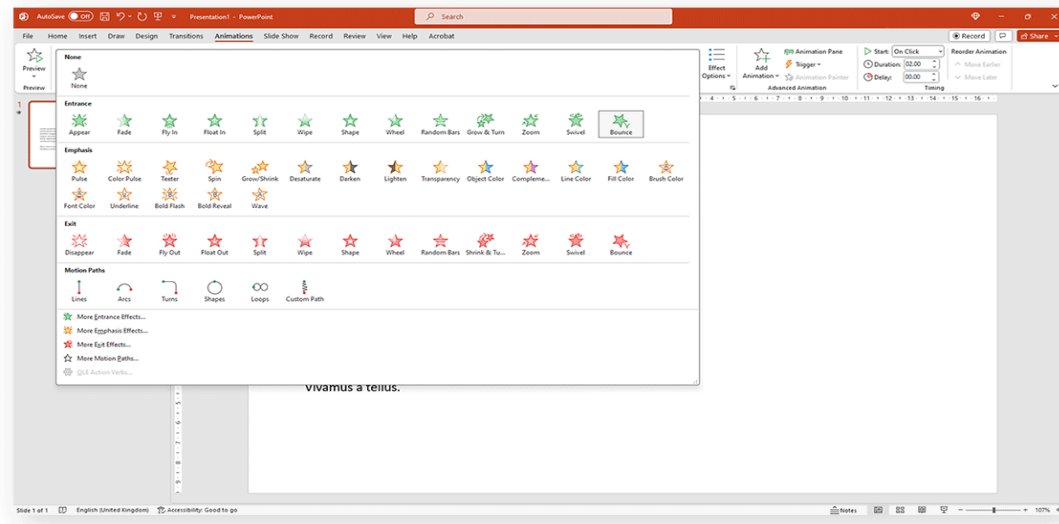
4.4.6 Apply a set of effects to animate the slide

Animation

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.

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.

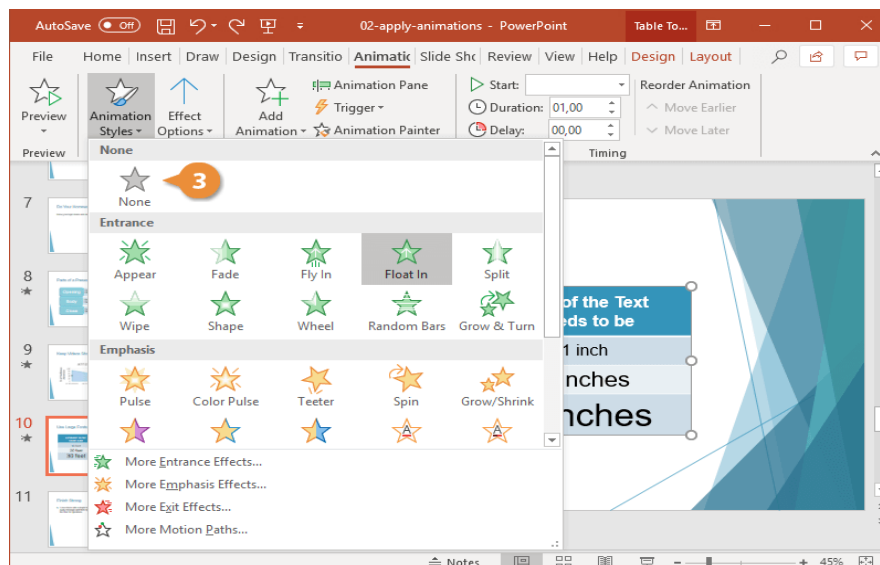


To specify the timing of the effects, on the **Animations** tab, use the commands in the **Timing** groups.

Perform custom Animation on one slide

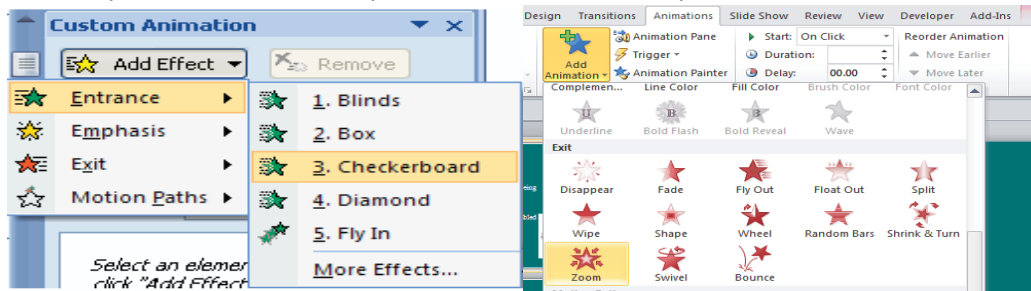
Custom animation allows you to consider the objects or the text boxes in a slide, one at a time, and to animate them as desired by the person not as given in the software.

- 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.



4.4.7 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.

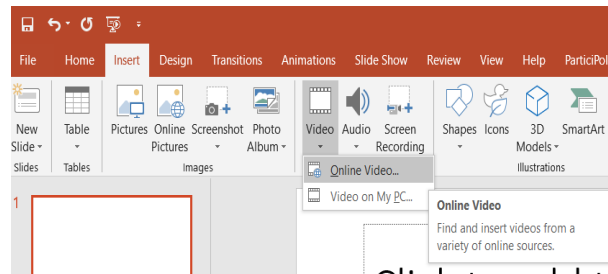
The following steps will help you add audio or video file to the slides.

Step - 1

Go to the **Media** group under the **Insert** ribbon

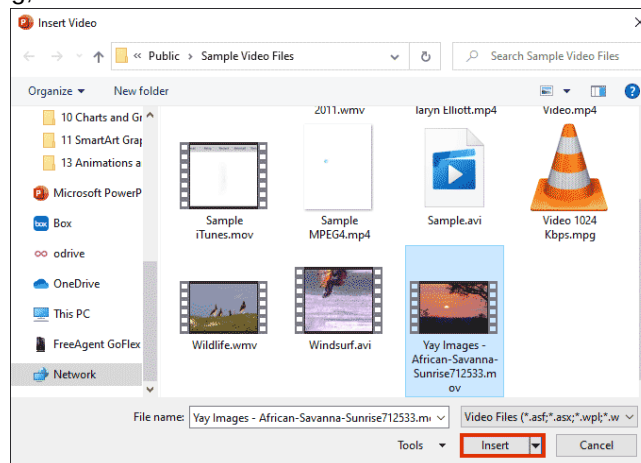
Step - 2

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



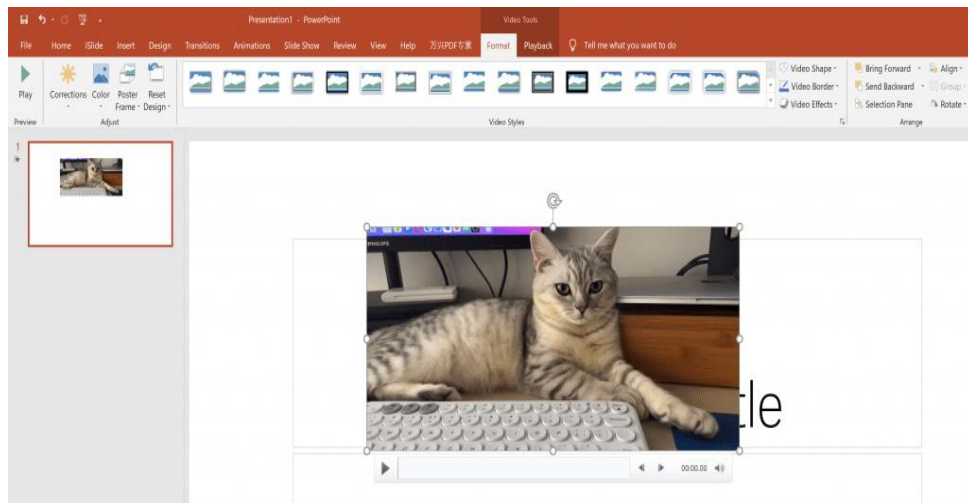
Step – 3

In the Insert Video dialog, browse for a video file and click Insert.



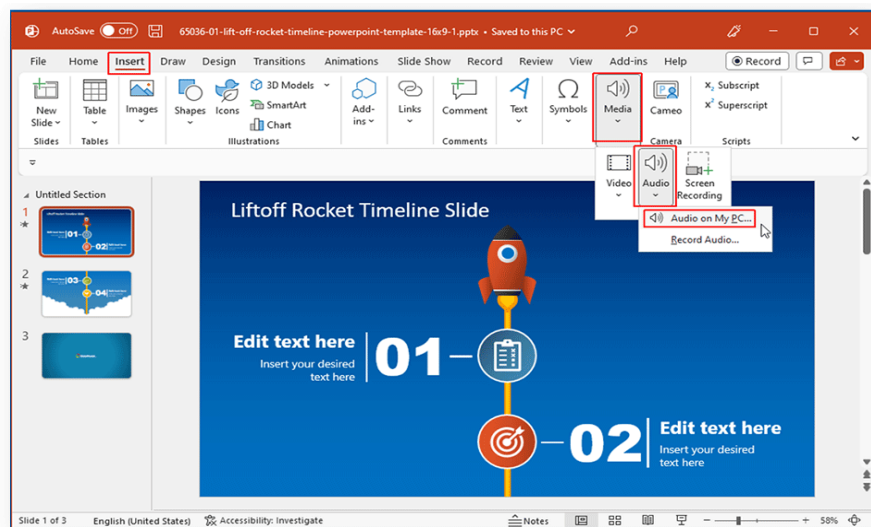
Step - 4

You will now see that a Video file is added to the slide



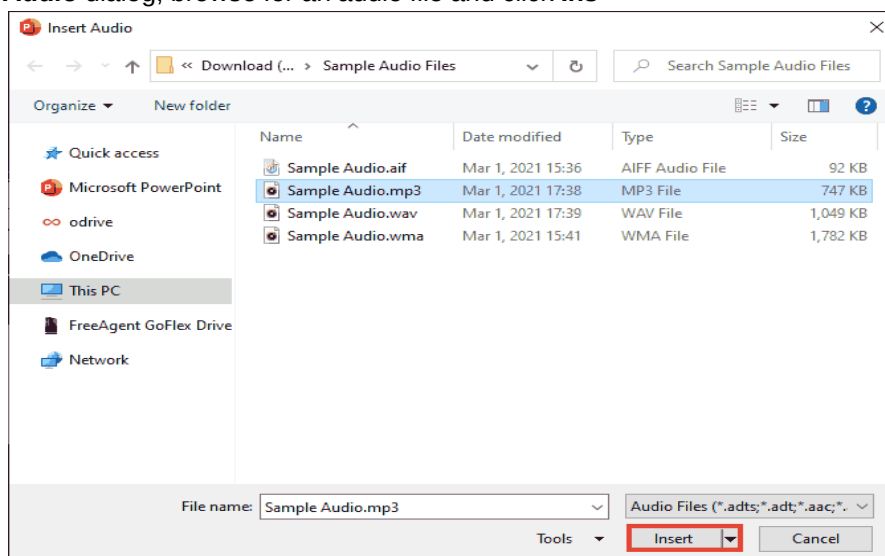
Step - 5

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 **Ins**



Activity 1:

Practice inserting slides with different layouts based on the presentation's needs. The task will be considered successful if students can:

- Select appropriate slide layouts (e.g., Title, Content, Two Content).
- Insert at least five slides with varied layouts.
- Ensure clear and balanced formatting for readability and visual appeal.

Activity2:

Practice inserting and formatting text, tables, and images into slides. Success is measured by the ability to:

- Format text with proper font size, style, and alignment.
- Insert tables with clear data and correct alignment.
- Add and position images to enhance visual appeal and clarity.

Activity3:

Practice applying effects, slide transitions, and sound effects based on presentation requirements. Success is measured by the ability to:

- Apply appropriate slide transitions for smooth progression.
- Use visual effects to enhance key elements (text, images).
- Add relevant sound effects to match the presentation's tone and content.

SUMMARY

This module provides a comprehensive understanding of computer systems, from basic hardware and software management to more advanced tasks like troubleshooting and system configuration.

In MS Word, learners will become proficient in creating, formatting, and managing documents, including applying styles, inserting tables, and preparing documents for printing.

In MS Excel, they will be trained to organize, analyze, and present data using spreadsheets, including working with formulas, charts, and graphs to display data effectively.

Trainees will learn to craft professional presentations in MS PowerPoint, incorporating various multimedia elements such as text, images, animations, and transitions to create engaging, dynamic slideshows.

FAQs:

Q1. What are the Peripheral devices?

Ans. A computer peripheral is an external device like a keyboard, mouse, or printer that provides input and output for the computer.

Q2. What is application software?

Ans. Application software is used in offices, homes, and schools to perform specific tasks, such as word processing, spreadsheets, databases, and graphics software.

Q3. What is the right way to uninstall a program?

Ans. The proper way to uninstall a program is by using the uninstall routine provided with the program or through the control panel.

Q4. What does scanning means?

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

Q5. What are computer viruses or bugs?

Ans. Computer viruses are small programs designed to spread between computers and disrupt their functioning.

Q6. What is external mass storage?

Ans. External mass storage devices are removable devices connected to a computer via a network or cable, like hard drives, USB flash drives, CDs, and floppy disks.

Q7. What is software troubleshooting process?

Ans. Software troubleshooting begins by identifying the problem, checking potential causes, and then finding solutions through measures and alternatives.

Q8. How do you save a document in Microsoft Word?

Ans. To save a document for the first time, press Ctrl+S, click the Save button on the Quick Access toolbar, or select Save from the File tab, all of which open a dialog box to name the document.

Q9. How do you format text, change font, and font size?

Ans. To format text, go to the Font group on the Home tab and click Bold, Italic, or Underline. To change the font and size, click the Font arrow for available fonts, then select the desired font size.

Q10. Describe way of creating a new table.

Ans. 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.

Q11. How do you save a spreadsheet in Microsoft Excel?

Ans. 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.

Q12. How do you format cells in a spreadsheet?

Ans. 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.

Q13. What is a worksheet functions?

Ans. 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.

Q14. What type of data can be inserted in slides of Power point.

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

Q15. How do you create a new presentation?

Ans. 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.

Q16. How do you select and apply Theme colors?

Ans. 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.

MCQs:**1. Identify the device through which data and instructions are entered into a computer**

- a. Software b. Output device c. Input device d. Memory

2. The output shown on the computer monitor is called

- a. VDU b. Hard copy c. Soft copy d. Screen copy

3. Tabs stop position cannot be the following alignment?

- a. Decimal Alignment b. Center Alignment
c. Bar Alignment d. Justify Alignment

4. How many maximum numbers of columns can be inserted in the word document?

- a. 45 b. 50 c. 55 d. 63

5. With which of the following all formulas in excel starts?

- a. / b. * c. \$ d. =

6. If you press, the cell accepts you typing as its contents?

- a. Tab b. Ctrl+Enter c. Enter d. Alt+Enter

7. 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

8. Which file format can be added to a power point show?

- a. Jpg b. gif c. wav d. All a, b & c

9. To spell check which function key you will press?

- a. F5 b. F6 c. F7 d. F8

10. Which of these toolbars allows changing of Fonts and their sizes?

- a. Standard b. Formatting c. Options d. None of above

11. Ctrl + D is short cut used for?

- a. Open Dialogue Box b. Font Dialogue Box
c. Save as Dialogue Box d. Save Dialogue Box

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. The printed output from a computer is called

- a. Copy b. Soft copy c. Hard copy d. Paper

True Answer

1.	c	2.	c	3.	d	4.	d
5.	d	6.	c	7.	a	8.	d
9.	c	10.	b	11.	c	12.	b
13.	c						

Learning Outcomes:

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

- Develop 2D Objects
- Prepare Final Set of 2D Drawings

Learning Unit 5.1**Develop 2D Objects****Learning Outcomes:**

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

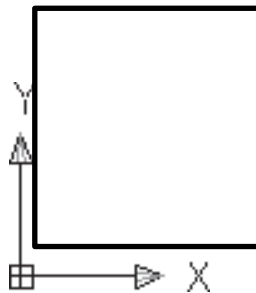
- Setup & save drawing interface for required specifications.
- Setup user interface settings for required specifications.
- Create 2D objects with given measurements.
- Edit 2D Objects to meet set standards.

5.1.1 Basic Drawings Concepts**Types of Drawing**

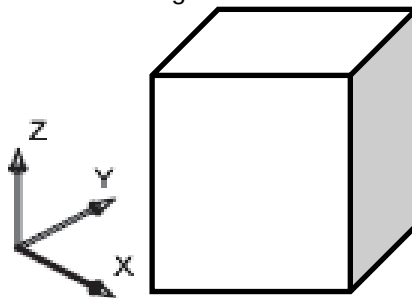
- Two-Dimensional drawing
- Three-Dimensional drawing

Two-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.

**Three-Dimensional drawing:**

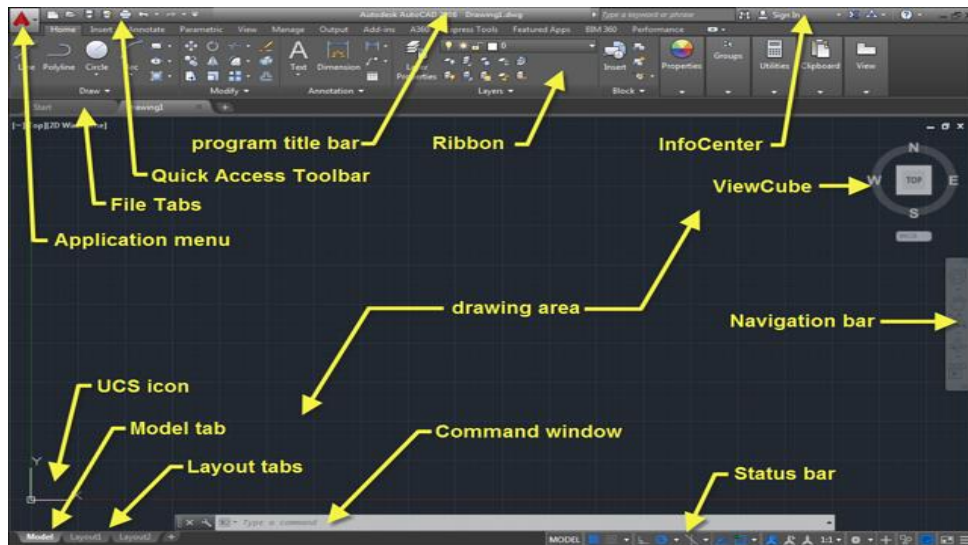
A physical object in which length, width, and depth are real attributes—a model, with X, Y, and Z-axes that can be rotated for viewing from different angles.

**5.1.2 AutoCAD Interface Introduction**

AutoCAD is a software developed by Autodesk for creating 2D and 3D designs. First launched in 1982, it is now available on desktop, mobile, and web as AutoCAD 360. It is widely used in fields like civil, mechanical, architectural, electrical, and graphic design. The AutoCAD interface provides essential tools like the drawing area, ribbon, command line, toolbars, and status bar, making it easy to create, edit, and view designs. AutoCAD helps professionals design with accuracy, speed, and efficiency using modern computer tools.

5.1.3 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.



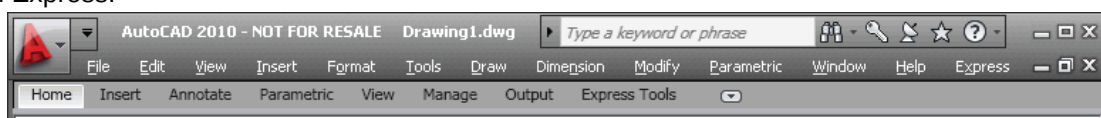
Quick Access toolbar

The **Quick Access Toolbar** is found at the top of AutoCAD, next to the application menu. It gives **quick access to commonly used commands** like **Save, Open, Undo, Redo, and Print**. You can also **add your favorite tools** to this toolbar for faster use.



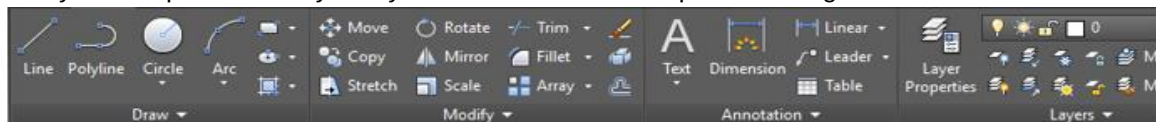
Menu Bar or Application Menu

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.



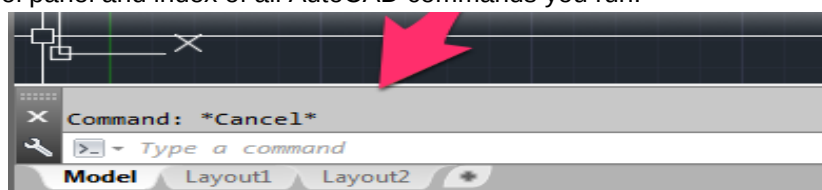
Ribbon

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.



Command bar or Command prompt

Command line is located in the bottom left corner of CAD interface. 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.

Create or Open New File

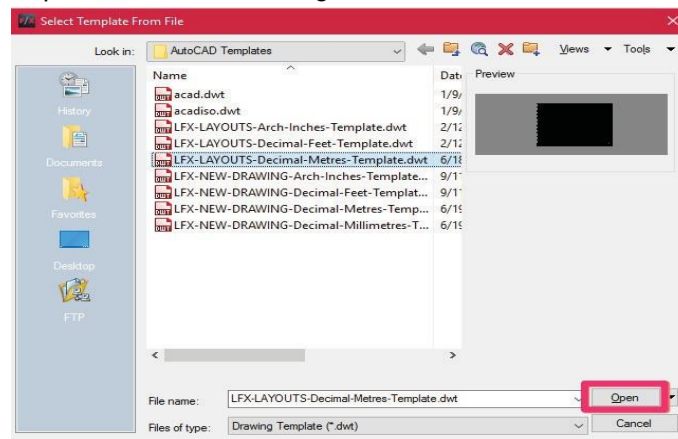
Create or open new file means to get a new drawing in AutoCAD or learner can also use a template already available in CAD templates library.

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.

Remember

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



5.1.4 Short keys of AutoCAD software

Function Keys

The Following functions keys are labeled F1 through F11:

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

Here are some commonly used AutoCAD shortcut keys to speed up your workflow:

Ctrl + N → New Drawing	ARC → Arc	SC → Scale
Ctrl + O → Open Drawing	SPL → Spline	MI → Mirror
Ctrl + S → Save Drawing	M → Move	F → Fillet
Ctrl + P → Print/Plot	CO (or CP) → Copy	CH → Chamfer
L → Line	O → Offset	STRETCH → Stretch
C → Circle	TR → Trim	Z → Zoom
REC → Rectangle	EX → Extend	P → Pan
PL → Polyline	RO → Rotate	LA → Layer Manager
LT → Line type Manager	LE → Leader	Ctrl + Y → Redo
MA → Match Properties	B → Create Block	Ctrl + C → Copy
T → Single-line Text	I → Insert Block	Ctrl + V → Paste
MT → Multiline Text	X → Explode	Ctrl + X → Cut
DIM → Dimension	Ctrl + Z → Undo	ESC → Cancel Command

5.1.5 Dimensions, Text and Symbols

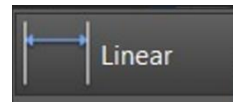
A dimension in AutoCAD is a measurement annotation that shows the size, length, angle, or other geometric properties of an object in a drawing.

Linear Dimension (DIMLINEAR)

Use to measure horizontal or vertical distances.

Procedure:

- Type DIM or DIMLINEAR in the command bar and press Enter.
- Click the first point (start of the dimension).
- Click the second point (end of the dimension).
- Move the mouse to place the dimension line and click to set it.

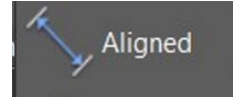


Aligned Dimension (DIMALIGNED)

Use for slanted or diagonal measurements.

Procedure:

- Type DIMALIGNED and press Enter.
- Click the first point of the dimension.
- Click the second point (aligned along the object).
- Move the cursor to position the dimension and click to place it.

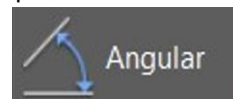


Angular Dimension (DIMANGULAR)

Use to measure angles between two lines.

Procedure:

- Type DIMANGULAR and press Enter.
- Select the first line of the angle.
- Select the second line forming the angle.
- Move the cursor to adjust the angle's position and click to place the dimension.

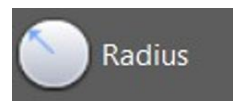


Radial Dimension (DIMRADIUS)

- Use to measure the radius of circles or arcs.

Procedure:

- Type DIMRADIUS and press Enter.
- Click on the arc or circle.
- Move the cursor outward to adjust the dimension.
- Click to place the dimension.

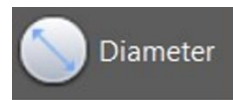


Diameter Dimension (DIMDIAMETER)

- Use to measure the diameter of circles.

Procedure:

- Type DIMDIAMETER and press Enter.
- Click on the circle or arc.
- Move the cursor outward and click to place the dimension.

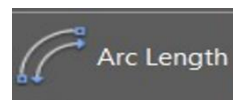


Arc Length Dimension (DIMARC)

- Use to measure the actual length of an arc (not just radius or diameter).

Procedure:

- Type DIMARC and press Enter.
- Click on the arc.
- Move the cursor outward and click to place the arc length dimension.

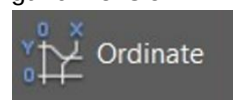


Ordinate Dimension (DIMORDINATE)

- Use to display X and Y coordinates of a point.

Procedure:

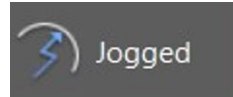
- Type DIMORDINATE and press Enter.
- Click the point you want to measure.



- Move the cursor to place the X or Y coordinate and click.

Continuous Dimension (DIMCONTINUE)

- Use to create a chain of dimensions.



Procedure:

- First, create a Linear Dimension.
- Type DIMCONTINUE and press Enter.
- Click on the previous dimension's second point.
- Click additional points to continue the dimension chain.

Leader Dimension (MLEADER / QLEADER)

- Use to create an annotation with a leader line.

Procedure:

- Type MLEADER (or QLEADER for older versions) and press Enter.
- Click the starting point of the leader line.
- Move the cursor and click to place the arrow.
- Type the annotation text and press Enter.

DIMEDIT Command in AutoCAD

The DIMEDIT command in AutoCAD is used to modify, rotate, move, or center existing dimensions. It is helpful for adjusting dimension text placement and appearance without deleting and redrawing dimensions.

Usage of DIMEDIT Command

The DIMEDIT command allows you to perform the following actions:

- **Home** – Moves the dimension text to its default position.
- **New** – Allows you to edit and replace the dimension text.
- **Rotate** – Rotates the dimension text to a specified angle.
- **Oblique** – Tilts the extension lines of a dimension to match an angled surface.

How to Use the DIMEDIT Command?

- Move Dimension Text to Default Position (Home)
- Restores dimension text to its original position.

Procedure:

- Type DIMEDIT and press Enter.
- Type Home and press Enter.
- Select the dimension you want to reset.
- The text will return to its default position.

Edit Dimension Text (New)

Replaces the existing dimension text with new custom text.

Procedure:

- Type DIMEDIT and press Enter.
- Type New and press Enter.
- Select the dimension to modify.
- Type the new text and press Enter.

Example: Instead of “50”, you can replace it with “50 mm”.

Rotate Dimension Text

Changes the angle of dimension text.

Procedure:

- Type DIMEDIT and press Enter.
- Type Rotate and press Enter.
- Select the dimension to modify.
- Enter the rotation angle (e.g., 45°) and press Enter.

Oblique Dimension Lines

Tilts the dimension's extension lines to match an inclined surface.

Procedure:

- Type DIMEDIT and press Enter.
- Type Oblique and press Enter.
- Select the dimension to modify.
- Enter the oblique angle (e.g., 30°) and press Enter.

Text

- Text in AutoCAD is essential for adding annotations, labels, dimensions, and descriptions to a drawing. AutoCAD provides two primary text types: Single-Line Text (DTEXT) and Multi-Line Text (MTEXT). These text types allow users to communicate design intentions clearly.

Single-Line Text (DTEXT)

- Single-line text is a basic text entity where each line is independent. It is useful for simple annotations like labels, names, and dimensions.

How to Create Single-Line Text

- Type TEXT or DTEXT in the command line and press Enter.
- Specify the insertion point by clicking anywhere in the drawing.
- Enter the text height (or press Enter to accept the default).
- Enter the rotation angle (or press Enter for default 0°).
- Type the text and press Enter to complete it.
- Press Enter again to exit the command.

Editing Single-Line Text

- Double-click on the text to edit it directly.

Multi-Line Text (MTEXT)

Multi-line text is more advanced and supports multiple lines in a single text box. It provides formatting options, making it useful for longer annotations, such as project descriptions, instructions, or notes.

How to Create Multi-Line Text

- Type MTEXT and press Enter.
- Click and drag a rectangle to define the text box.
- The Text Editor opens automatically.
- Type the required text inside the text box.
- Format the text using the ribbon (bold, italic, font changes, alignment, etc.).
- Click outside the text box or press Ctrl + Enter to finish.

Editing Multi-Line Text

- Double-click on the text to open the MText Editor.
- Use the PROPERTIES palette (Ctrl + 1) to adjust text height, width, and style.

Text Styles (STYLE Command)

Text styles allow users to standardize text across a drawing by defining font, height, width, and alignment.

How to Create and Modify Text Styles

- Type STYLE and press Enter.
- The Text Style Manager opens.
- Click New to create a new style or modify to change an existing one.
- Choose a Font, set Height, adjust Width Factor, and set Oblique Angle (for slanted text).
- Click Apply and then Close.
- Use TEXT or MTEXT and select the style from the Properties panel.

Common Text Style Settings

- Standard: Default style in AutoCAD.
- Annotative Text: Adjusts size automatically based on drawing scale.
- Bold or Italic Text: Can be achieved by choosing appropriate fonts in the Style Manager.

Converting Text

- AutoCAD provides tools to convert text from one form to another.
- Converting Single-Line Text to Multi-Line (TXT2MTXT)
- Type TXT2MTXT and press Enter.
- Select the single-line text objects to convert.
- Press Enter to combine them into a multi-line text block.

Exploding Multi-Line Text to Single-Line (EXPLODE)

- Type EXPLODE and press Enter.
- Select an MTEXT object.
- Press Enter to finish.

Symbols

AutoCAD uses various symbols to represent different geometric, annotation, and engineering elements. These symbols help in technical drawings, schematics, and architectural plans.

Common AutoCAD Symbols

A. Geometric Symbols

Symbol	Name	Description
∅	Diameter	Represents the diameter of a circle. Used in dimensions.
R	Radius	Shows the radius of an arc or circle.
∠	Angle	Used to indicate angular dimensions.
Ø	Round	Used to specify circular or rounded features.
Δ	Triangle	Used for datum reference or tolerance zones.

B. Dimension & Annotation Symbols

Symbol	Name	Description
±	Tolerance	Represents plus/minus tolerance in dimensions.
⌞	Reference	Denotes a reference dimension (not an actual measurement).
⊥	Perpendicular	Indicates a 90-degree relationship between two objects.
//	Parallel	Shows that two lines or surfaces are parallel.
≠	Not Equal	Used in constraints to specify inequality.

C. Architectural & Structural Symbols

Symbol	Name	Description
□	Door	Represents a door in floor plans.
▢	Window	Symbolizes a window in building drawings.
△	Roof	Used in elevation drawings to indicate a roof.

D. Electrical Symbols

Symbol	Name	Description
⏏	Ground	Represents electrical grounding.
⚡	Transformer	Symbolizes an electrical transformer.
~	Alternating Current (AC)	Used to indicate AC power supply.
—	Direct Current (DC)	Represents DC power source.

E. Welding Symbols

Symbol	Name	Description
△	Fillet Weld	Specifies a fillet weld.
○	Spot Weld	Indicates a spot weld location.
—	Seam Weld	Represents a continuous weld seam.

5.1.6 Scale and Paper Sizes in AutoCAD

In AutoCAD, drawings are created in real-world dimensions using Model Space, while they are presented and printed at different scales in Layout Space.

Types of Scale in AutoCAD:

- Model Space Scale: Always 1:1 (real-world dimensions).
- Viewport Scale (Layout Space): Controls how the model is displayed in paper space.

Common Drawing Scales:

Scale	Ratio	Used for
1:1	Full Scale	Manufacturing drawings
1:2	Half Scale	Mechanical parts
1:10	10 times smaller	Architectural floor plans
1:50	50 times smaller	Site plans, large buildings
1:100	100 times smaller	City maps, large-scale drawings

How to Set Scale in Viewport (Layout Space)?

- Switch to Layout and activate a Viewport.
- Select the Viewport, then choose a scale from the Properties Panel (e.g., 1:50).
- Lock the Viewport to prevent accidental changes.

Paper Sizes

AutoCAD supports different paper sizes based on ISO (A-series) and ANSI standards.

ISO (International Standard) A-Series Paper Sizes

Paper Size	Dimensions (mm)	Dimensions (inches)
A0	841 × 1189	33.1 × 46.8
A1	594 × 841	23.4 × 33.1
A2	420 × 594	16.5 × 23.4
A3	297 × 420	11.7 × 16.5
A4	210 × 297	× 11.7

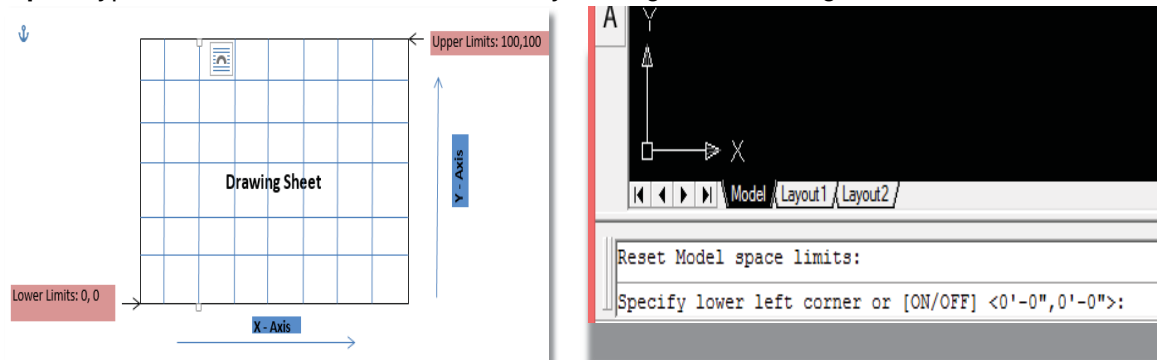
5.1.8 Drawing Limits and Units

Drawing Limits

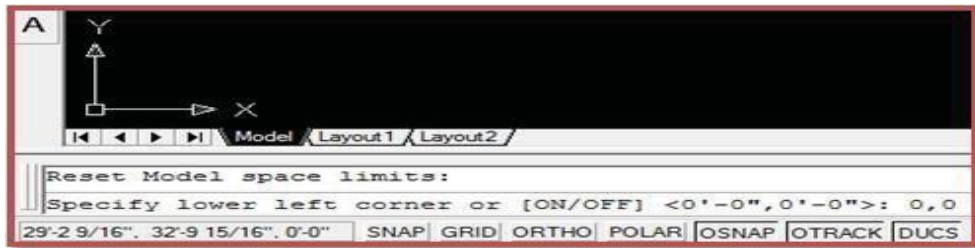
Drawing limits define the drawing boundaries, usually matching the sheet size. In AutoCAD, setting limits correctly helps display the grid over the working area. To show all grid limits, enable the Grid element from the status bar. Drawing Limits define drawing sheet with horizontal and vertical coordinates as shown below.

Procedure

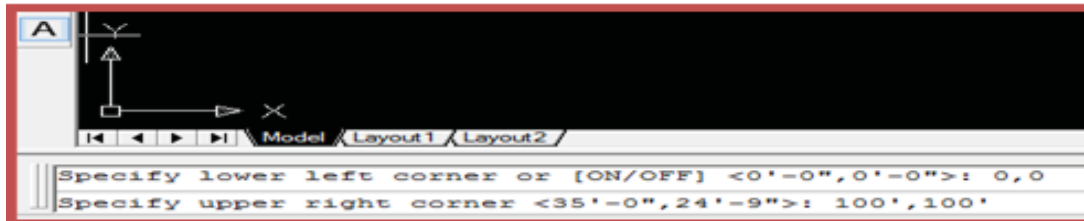
Step-1: Type **limits** command in command bar, you will get the following instructions.



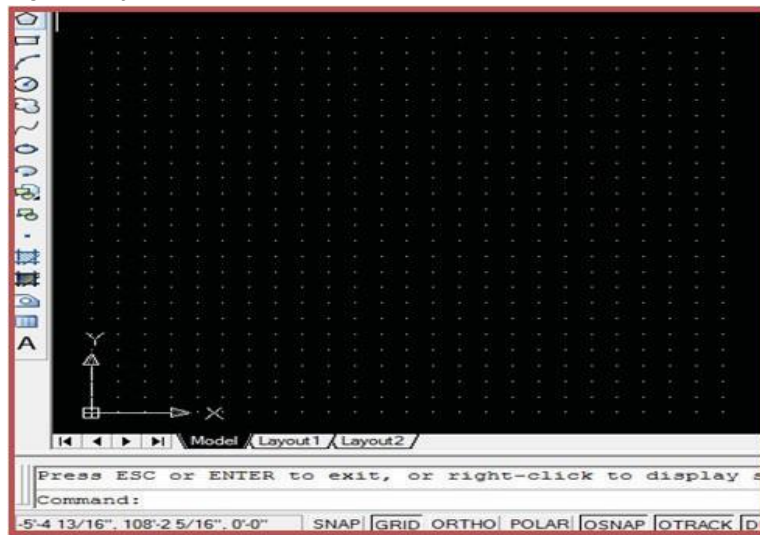
Step-2: Define the lower Left corner as 0, 0



Step-3: Define the Upper Right corner as 100-feet, 100-feet.



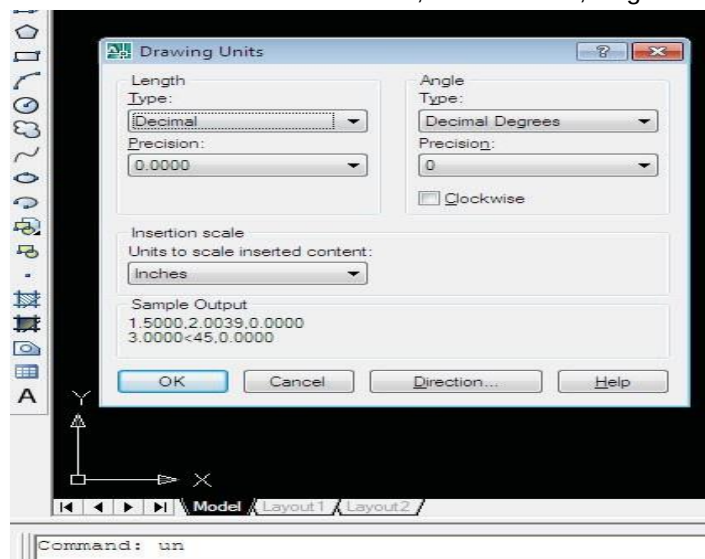
Step-4: Grid Display: Now you can see the defined limits to On Grid elements in status bar



Unit Control

The dialogue box is separated into four main sections.

Length type: Which refers to linear units: Like Decimal, Architectural, Engineering etc.



Angles: Referring to angular units

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.

Insertion Scale: Selection of different measurement as per length type, like feet or inches for Architectural drawing.

5.1.9 AutoCAD Commands and Tools

AutoCAD provides a wide range of commands and tools for creating, modifying, and annotating drawings efficiently. Below is a categorized list of essential AutoCAD commands and their uses.

A. Basic Drawing Commands

Command	Description
LINE	Draws a line between two points
POLYLINE	Creates a connected series of line segments
CIRCLE	Draws a circle
ARC	Creates an arc
RECTANGLE	Draws a rectangle
ELLIPSE	Draws an ellipse

B. Modify Commands

Command	Description
MOVE	Moves objects from one location to another
COPY	Creates a duplicate of selected objects
ROTATE	Rotates selected objects
SCALE	Resizes an object proportionally
MIRROR	Creates a mirrored copy of an object
OFFSET	Creates parallel copies of objects
TRIM	Cuts off parts of an object using another object as a boundary
EXTEND	Extends a line to meet another object
FILLET	Creates a rounded corner between two lines
CHAMFER	Creates a beveled edge between two lines
STRETCH	Stretches a portion of an object

C. Annotation Commands

Command	Description
TEXT	Creates a single-line text
MTEXT	Creates multi-line text
DIMLINEAR	Adds a linear dimension
DIMALIGNED	Creates a dimension aligned with an object
DIMRADIUS	Adds a radius dimension
DIMDIAMETER	Adds a diameter dimension
LEADER	Draws an annotation leader line

D. Layers & Properties Commands

Command	Description
LAYER	Opens the layer manager
LAYISO	Isolates a specific layer
LAYOFF	Turns off selected layers
MATCHPROP	Copies properties from one object to another

E. Blocks & Hatching Commands

Command	Description
BLOCK	Creates a block from selected objects
INSERT	Inserts a saved block
HATCH	Fills a closed shape with a pattern
ARRAY	Creates multiple copies of objects in a pattern

F. View & Navigation Commands

Command	Description
ZOOM	Zooms in or out
PAN	Moves the view without changing zoom
REGEN	Regenerates the drawing to update display

G. Selection & Inquiry Commands

Command	Description
DIST	Measures the distance between two points
ID	Displays the coordinates of a selected point
LIST	Displays properties of selected objects
SELECT	Selects objects in the drawing

H. Advanced & Utility Commands

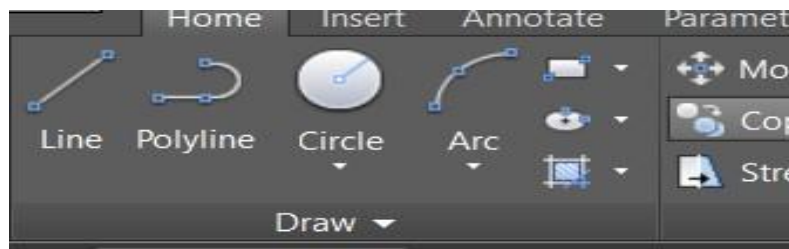
Command	Description
XREF	Attaches external references
PURGE	Removes unused objects from the drawing
AUDIT	Checks for errors in the drawing
RECOVER	Recovers a corrupt drawing file

I. File Management Commands

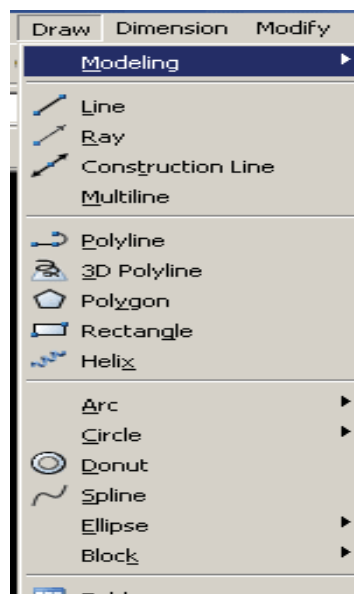
Command	Description
NEW	Creates a new drawing
OPEN	Opens an existing drawing
SAVE	Saves the current drawing
PLOT	Prints the drawing
EXPORT	Saves the drawing in another format

5.1.10 Functions of Creating, Editing and Modifying Tools

Draw toolbar



Draw Menu bar



Line:

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

Draw Menu	Draw Toolbar	Command Entry
Line		Line/L

Remember

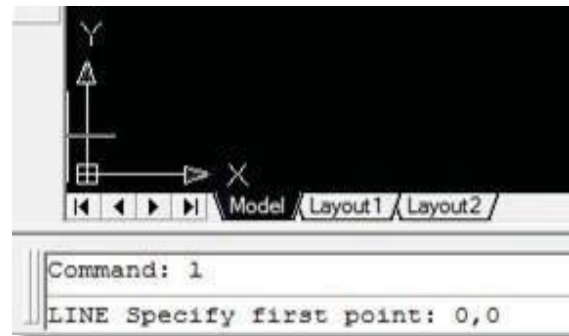
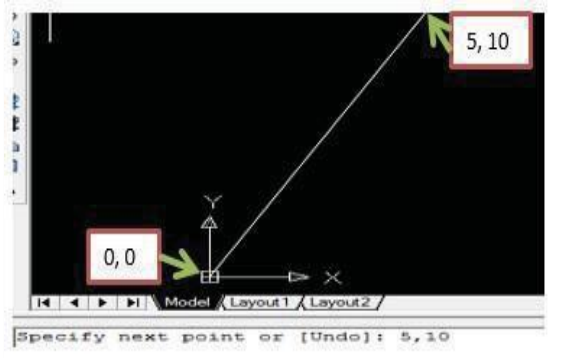
There are six types of lines using drafting AutoCAD

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



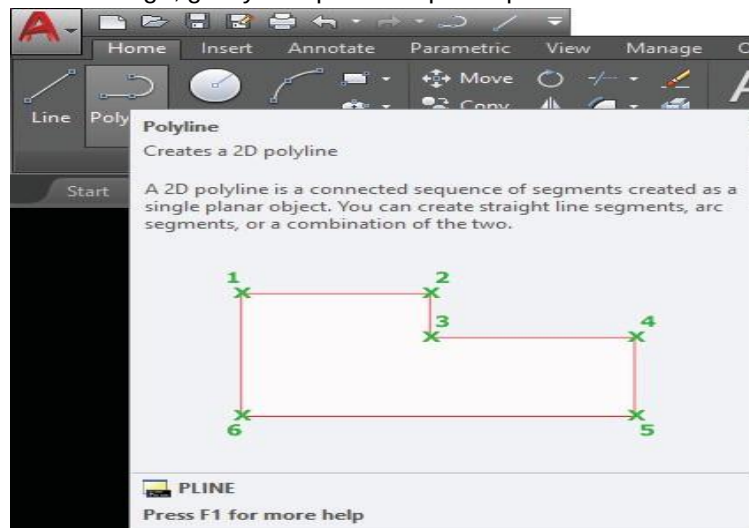
Draw polyline

A polyline is a single object composed of line and arc segments.

- Methods to Draw a Polyline:
- Menu Bar: Draw → Polyline → Click on the icon
- Shortcut Key: PL → Enter

Command: PL POLYLINE

- 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/Half width/Length/Undo/Width]:
- To respond the message, give your options as per requirements as under.



- To draw the Arc type A and press enter Half width:
- To draw the halfwidth type H and press 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

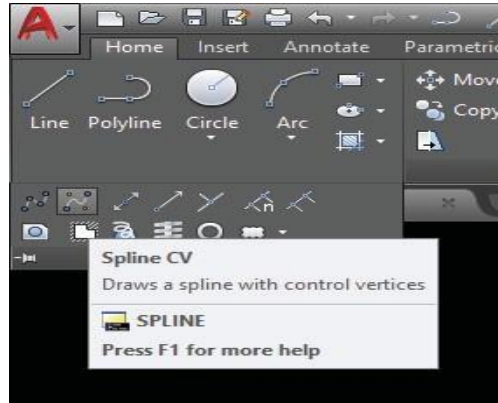
Draw Spline

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.

Methods to Draw a SPLINE

- Draw menu bar □ Spline □ click on icon or
- Short key
- SPL Press Enter

Command: SPL SPLINE



Command Line Messages for Polyline:

1. Specify first point: Select a point in the graphics window (e.g., 2,6 → Enter).
2. Current settings: Method=Fit Knots=Chord
3. Specify first point or [Method/Knots/Object]:

Method: Defines whether the spline uses fit points or control vertices.

Knots: Determines how curve segments blend between fit points (controlled by SPLKNOTS system variable).

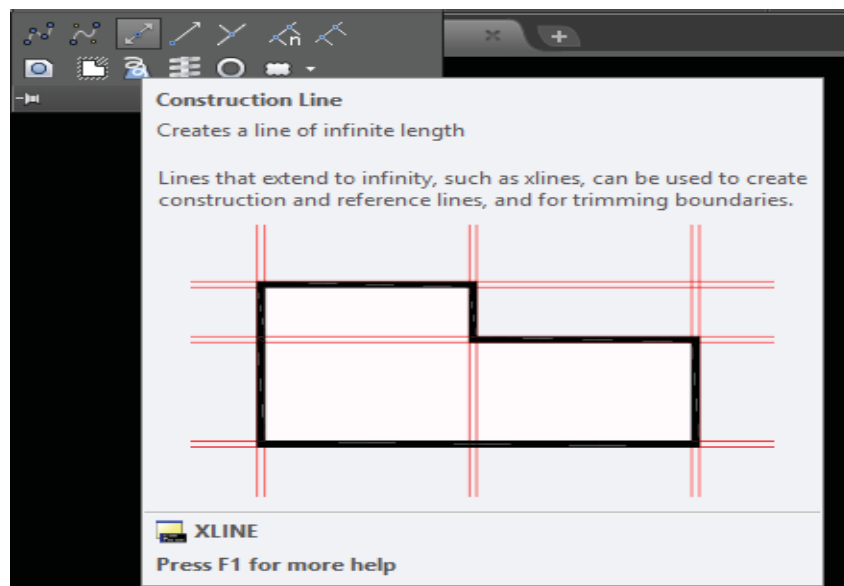
Object: Converts 2D/3D spline-fit polylines into splines.

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.

Draw Ray line

A Ray is a linear object that starts at a point and extends infinitely in one direction.

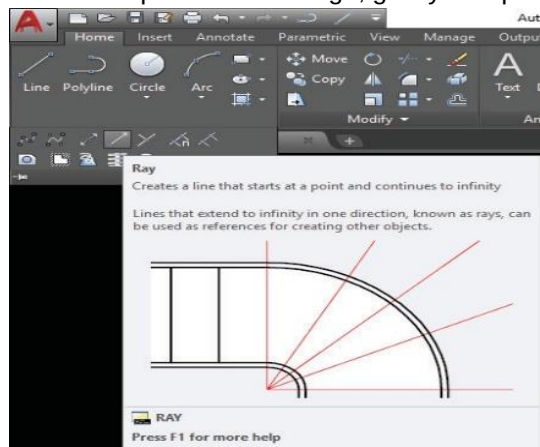
Methods to Draw a Ray:

- **Menu Bar:** Draw → Ray → Click on the icon
- **Shortcut Key:** RAY → Enter

Command: 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



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

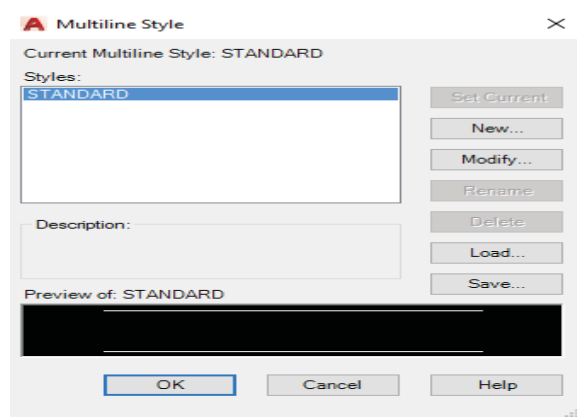
- Draw menu bar → multi-Line → click on icon
- Or short key ML → Enter

Multiline (ML)

Command: ML → Enter

Current Settings:

- Justification = Top
- Scale = 1.00
- Style = STANDARD



Command Line Options:

- **Justification:** Defines multiline position (Top, Bottom, Center).

- Scale: Sets the spacing between multiline components.
- Style: Defines the multiline style (e.g., STANDARD, custom styles).

Example:

- Start point: 10,10 → Enter
- Next points: 22,10 → 22,22 → 10,22 → C (Close)

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.

Justification in multiline

Top

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

Zero

This option will produce a multiline in which the zero offset position of the multiline coincides with the selected points.

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.

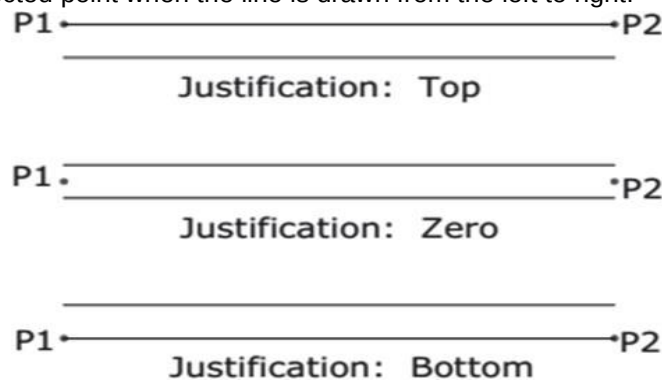
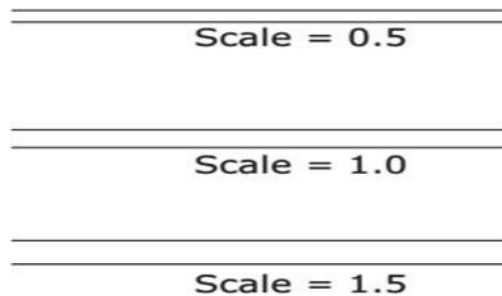


Figure: Different multiline scales



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.

Line Type

Line types can be continuous or patterned (dashes, dots, text, symbols). The current line type setting controls the default appearance of new objects.

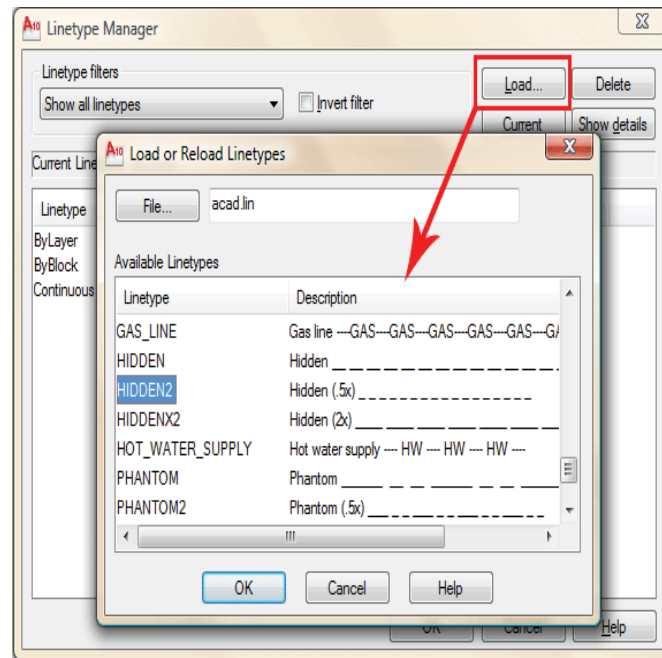
Ways to Check/Change Line Type:

Ribbon: Home tab → Properties panel (when no objects are selected).

Command Line:

Type: LT → Enter

AutoCAD Window: Displays line type settings and options.



Line type Scale

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

- Type LTS enter and type scale factor.

HIDDEN - LINETYPE SCALE = 1

HIDDEN - LINETYPE SCALE = .5

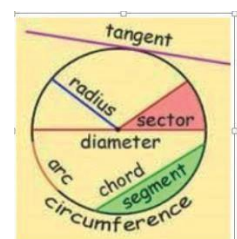
HIDDEN - LINETYPE SCALE = 5

Circle Command and its parts

- A circle is a round shape made by all points that are the same distance from the center. The total angle in a circle is 360 degrees.

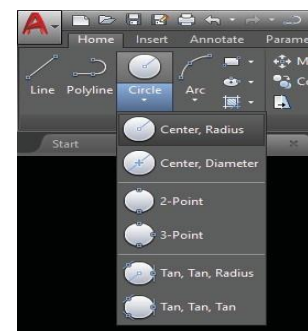
Here are the main parts of a circle:

- Circumference: The distance around the circle.
- Radius: A line from the center to the edge.
- Diameter: A line that goes across the circle through the center.
- Chord: A line joining two points on the circle but not through the center.
- Tangent: A line that touches the circle at only one point.
- Arc: A part of the circle's curve between two points.
- Sector: A slice of the circle made by two radii and an arc.
- Segment: The area between a chord and an arc.

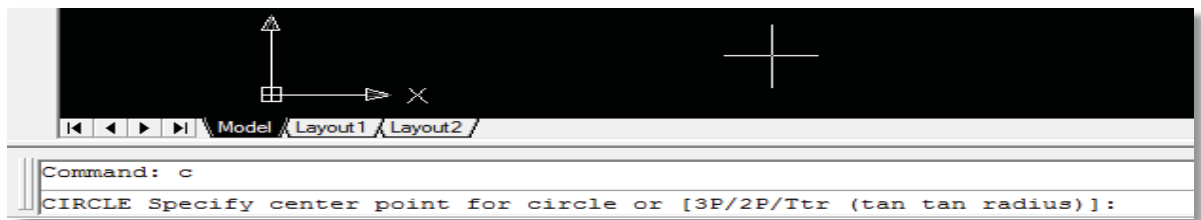


Procedure: How to create circle

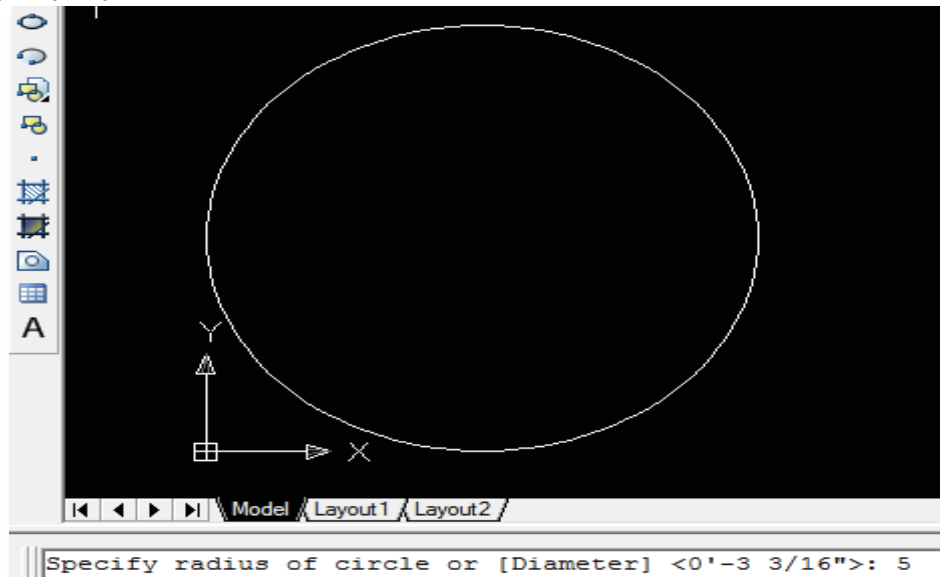
Draw Manu	Draw Toolbar	Command Entry
Circle		Circle/C



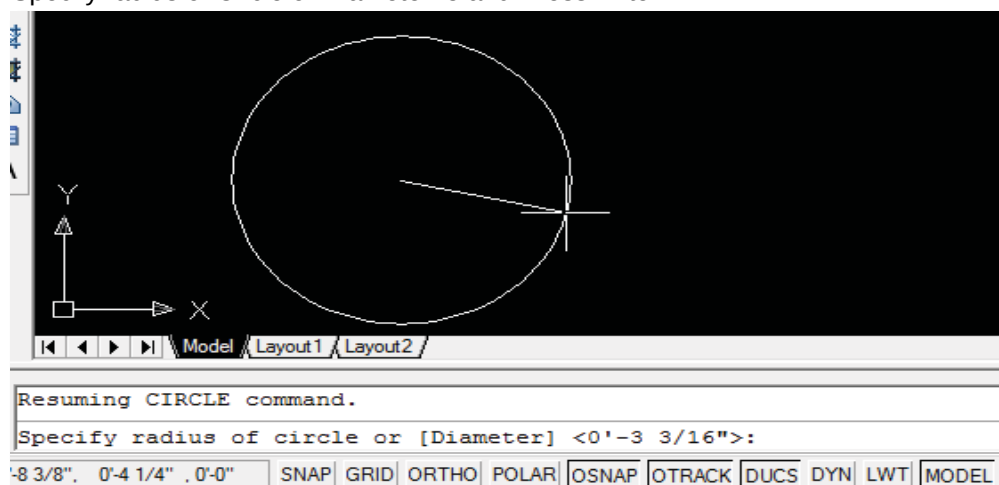
Step-1: Type C, Circle in command Bar and Press Enter



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

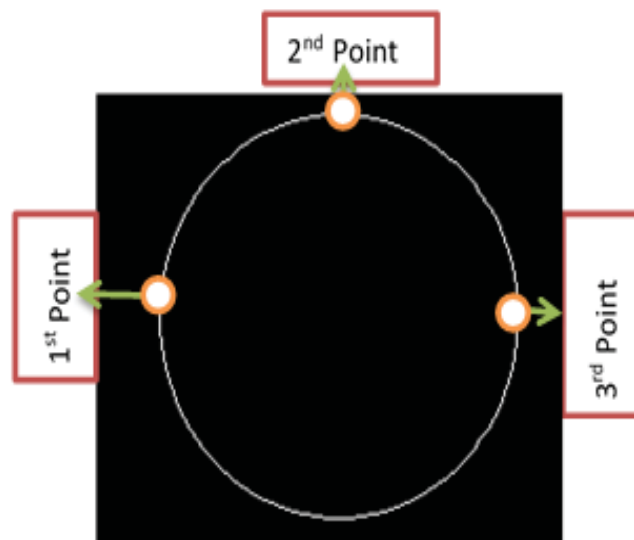
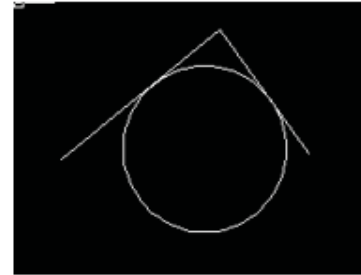
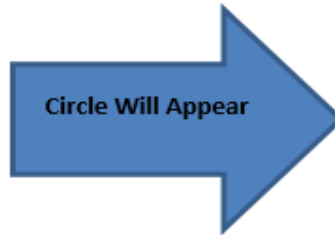
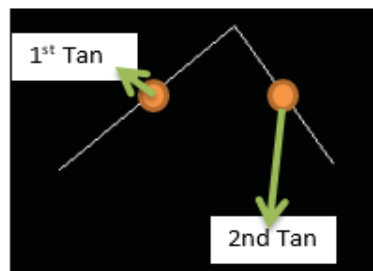
Step-1: Type C Command (see methods above)

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 Circle

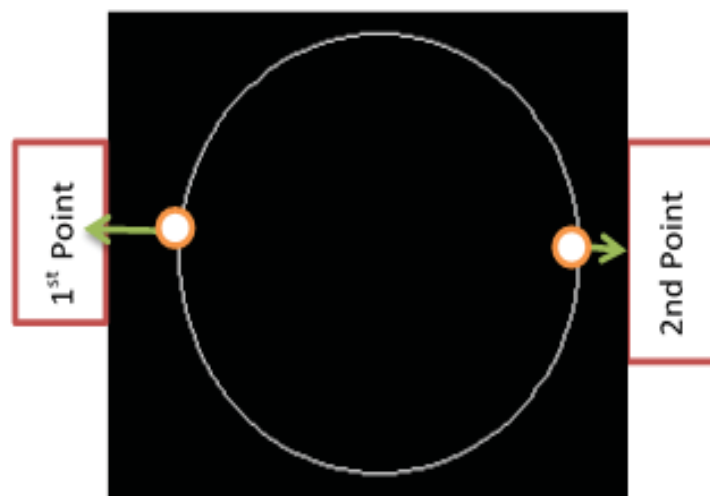
Procedure: How to create circle with 2-P

Step-1: 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

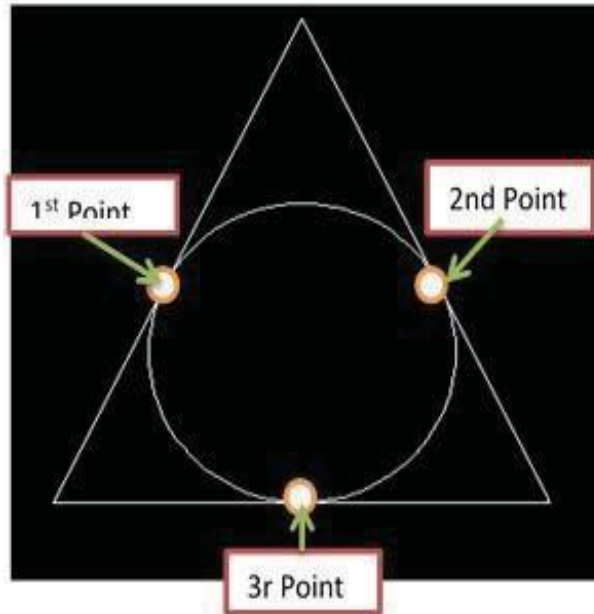


Tan Tan Tan (TTT)

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



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.

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.

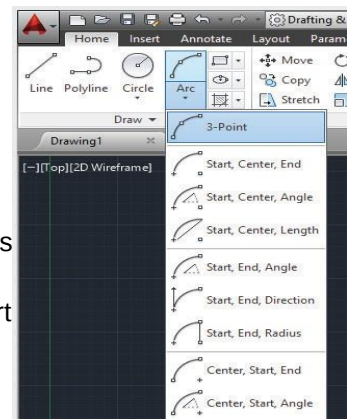
Specify second point of arc or [Center /End]:

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.





Center

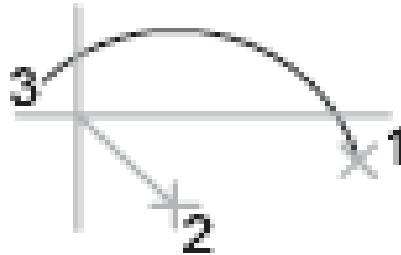
Specifies the center of the circle of which the arc is a part. Specify center point of arc:

Specify end point of arc or [Angle/chord Length]:

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).

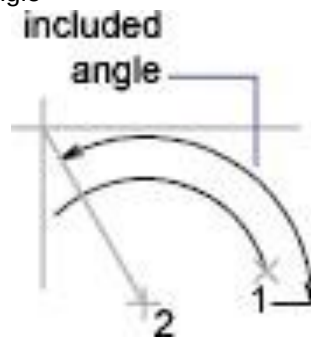
The arc does not necessarily pass through this third point, as shown in the illustration.



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

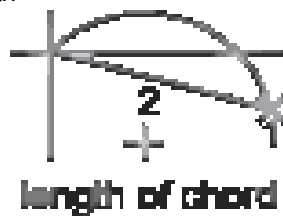


Chord Length

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

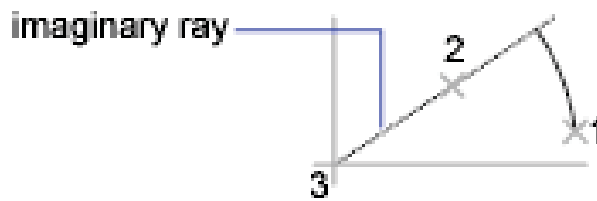
Specifies the endpoint of the arc. Specify end point of arc:

Specify center point of arc or [Angle/Direction/Radius]:

Center Point

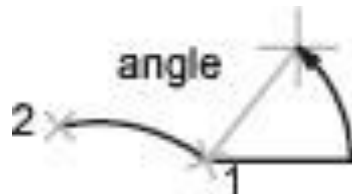
Draws an arc counter clockwise from the start point (1) to an endpoint that falls on an imaginary ray drawn from the center point (3) through the second point specified (2).

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.

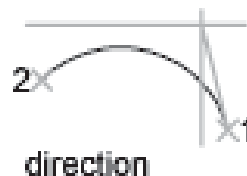
Specify included angle: Enter an angle in degrees or specify an angle by moving the pointing device counter clockwise.



Direction

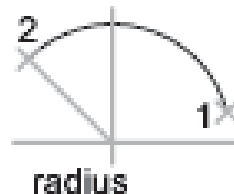
Begins the arc tangent to a specified direction. It creates any arc, major or minor, clockwise or counter clockwise, beginning with the start point (1), and ending at an endpoint (2). The direction is determined from the start point.

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

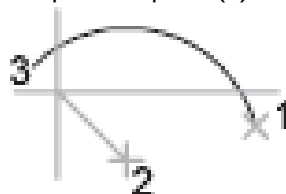
Specifies the center of the circle of which the arc is a part. Specify center point of arc:

Specify start point of arc:

Specify end point of arc or [Angle/chord Length]:

End Point

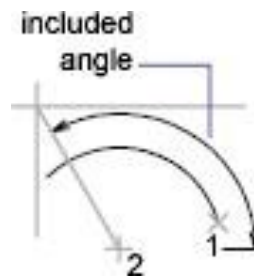
Draws an arc counter clockwise from the start point (2) to an endpoint that falls on an imaginary ray drawn from the center point (1) through a specified point (3).



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:

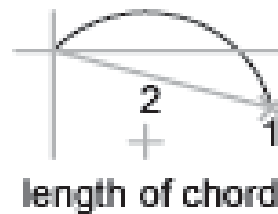


Chord Length

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.

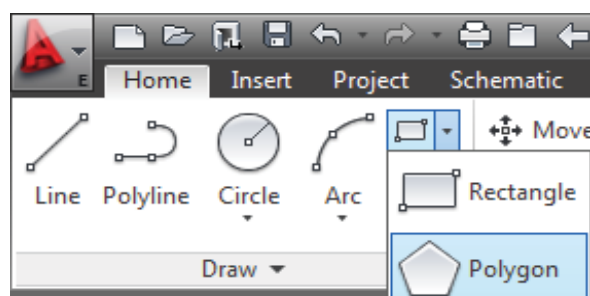
Specify end point of arc: *Specify a point (1)*



Rectangle

Creates a rectangular poly line from the specified the rectangle parameters (length, width, rotation) and type of corners (fillet, chamfer, or square).

Draw Manu	Draw Toolbar	Command Entry
Rectangle		rec



There is basic three types of rectangles, **area, dimension and rotation**.

Procedure

Click Home tab ► Draw panel ► Rectangle. Specify the first corner of the rectangle. Specify the other corner of the rectangle.

OR

Short key REC Enter

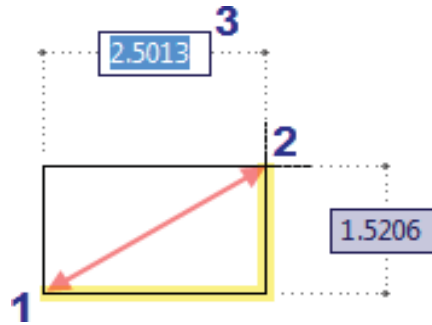
Area

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.



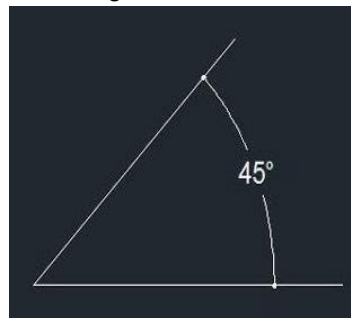
Dimensions

Creates a rectangle using length and width values.



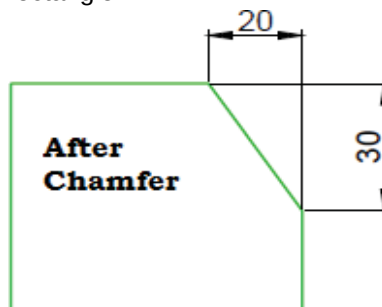
Rotation

Creates a rectangle at a specified rotation angle.



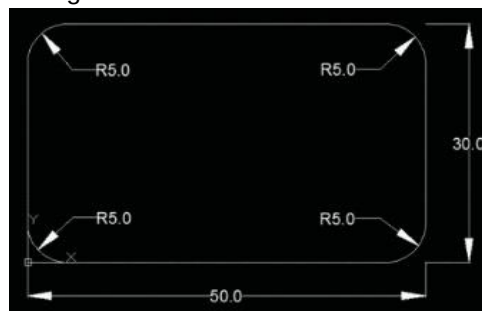
Chamfer

Sets the chamfer distances for the rectangle.



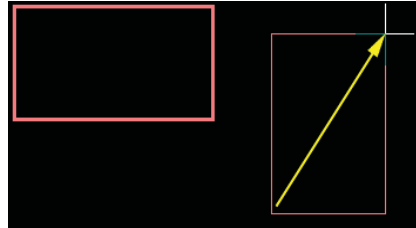
Elevation

Specifies the elevation of the rectangle.



Fillet

Specifies the fillet radius of the rectangle



Thickness

Specifies the thickness of the rectangle.

Width

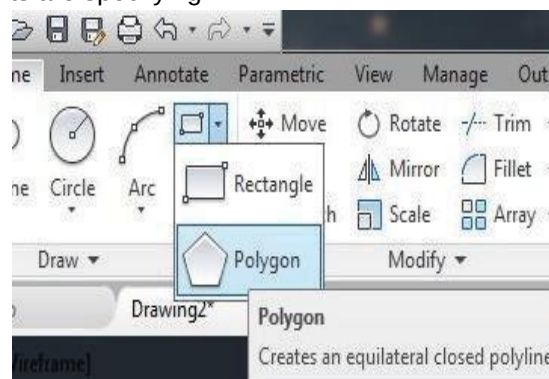
Specifies the polyline width of the rectangle to be drawn.



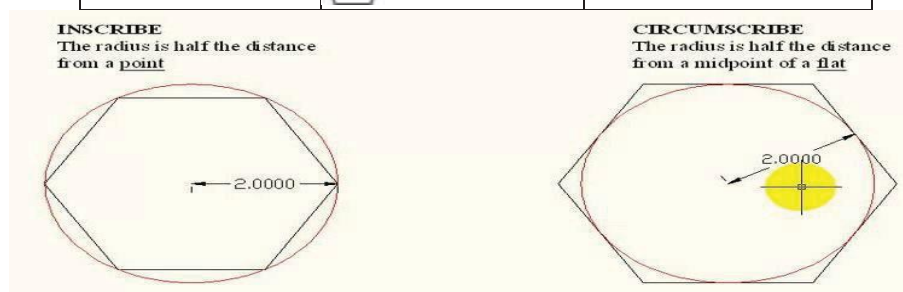
Polygon

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 dge. In each case, two points are specifying.

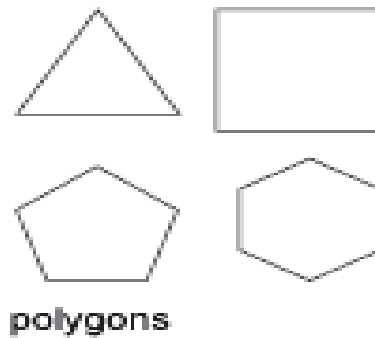


Draw Menu	Draw Toolbar	Command Entry
Polygon		POL



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



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

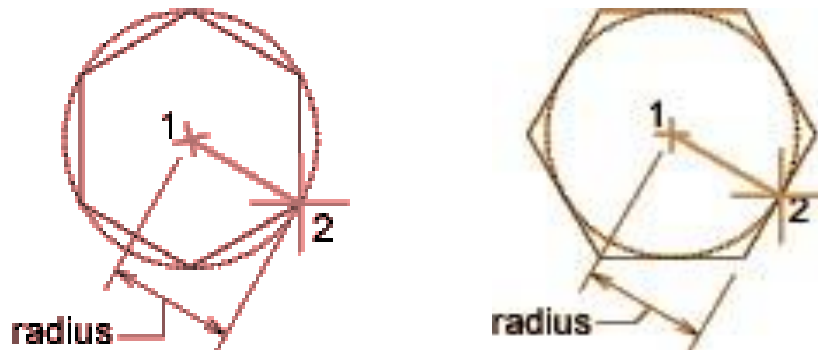
Specifying the radius with your pointing device determines the rotation and size of the polygon. Specifying the radius with a value draws the bottom edge of the polygon at the current snap rotation angle.

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.



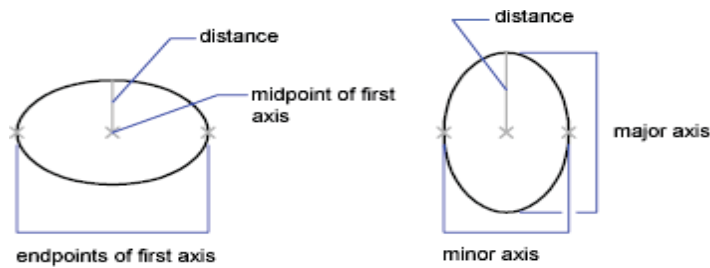
Ellipse

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 Menu	Draw Toolbar	Command Entry
-----------	--------------	---------------

Ellipse		EL
---------	---	----



Axis Endpoint

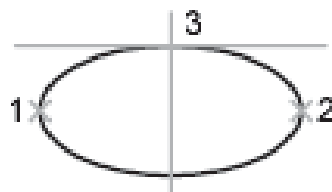
Defines the first axis by its two endpoints. The angle of the first axis determines the angle of the ellipse. The first axis can define either the major or the minor axis of the ellipse.

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).



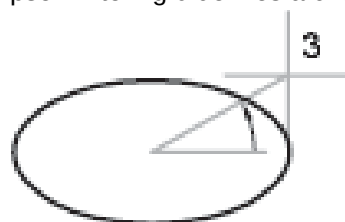
ellipse by axis endpoint

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 a 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

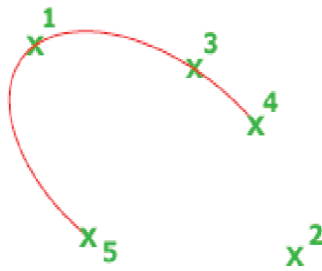
Arc

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.

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**



Hatch

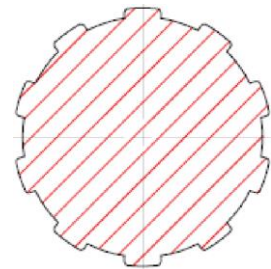
Fills an enclosed area or selected objects with a hatch pattern, solid fill, or gradient fill. In hatch apply different material as required and justify the scale

Draw Manu	Draw Toolbar	Command Entry
Hatch		H

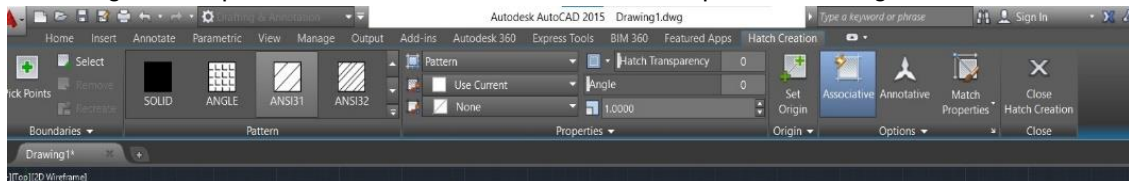
Command: Hatch

The Hatch and Gradient dialog box are 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 Max Hatch 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.



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



Donut

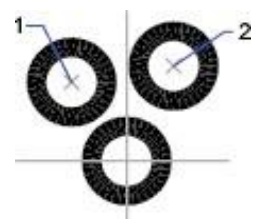
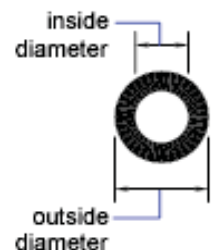
Creates a filled circle or a wide ring or Donut is special type of circle that describes inside outside circle in a same time. A donut consists of two arc polylines that are joined end-to-end to create a circular shape. The width of the polylines is determined by the specified inside and outside diameters. 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

- Type **DONUT** in the command line and press **Enter**.
- Specify Inside Diameter
- Type a number (e.g., 0 for a solid circle) and press **Enter**.
- Specify Outside Diameter
- Type a number (must be bigger than inside diameter) and press **Enter**.
- Pick Center Point(s)
- Click where you want to place the donut(s).
- You can click multiple points to draw more donuts.



- Press **Enter** to finish the command.

Point

To set point style and size

POINT Creates a point object.

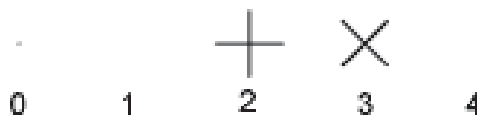
Draw Manu	Draw Toolbar	Command Entry
Point		point

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.

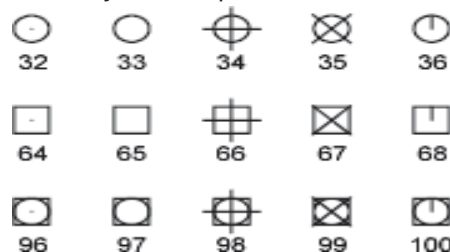
The PDMODE and PDSIZE system variables control the appearance of point objects. PDMODE values 0, 2, 3, and 4 specify a figure to draw through the point. A value of 1 specifies that nothing is displayed. Specifying the value 32, 64, or 96 selects a shape to draw around the point, in addition to the figure drawn through it:



5.1.11 Function of Blocks

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

- You can insert them again and again, saving time. In fact, you can insert them into other drawings as well.
- A block uses less electronic space than individual objects, so your drawing file is smaller.
- By updating a block's definition, you can update all the blocks in the drawing.

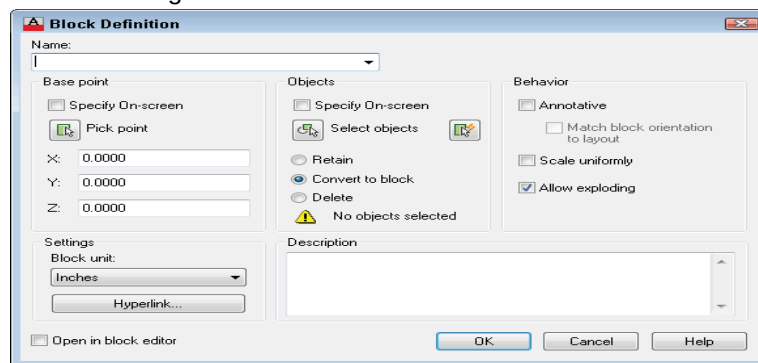


How to create a block?

To create a block, follow these steps:

- Draw the objects that you want in the block.
- Choose Home tab> Block panel> Create to start the BLOCK command. The Block Definition dialog box opens.
- Type a name in the Name text box. The name can have spaces.
- 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.
- 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.
- Just below, choose Retain, Convert to Block, or Delete. These options control what happens after you create the block.
- In the Behavior section, you can make a block Annotative (more info here), force it to scale uniformly and choose whether to allow exploding.
- In the Settings area, choose the block unit. You can choose Unit less 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.



5.1.12 Types of file extensions for Saving Files

Plotting for Save drawing in different format (e.g. dwg., PDF, JPG. etc.).

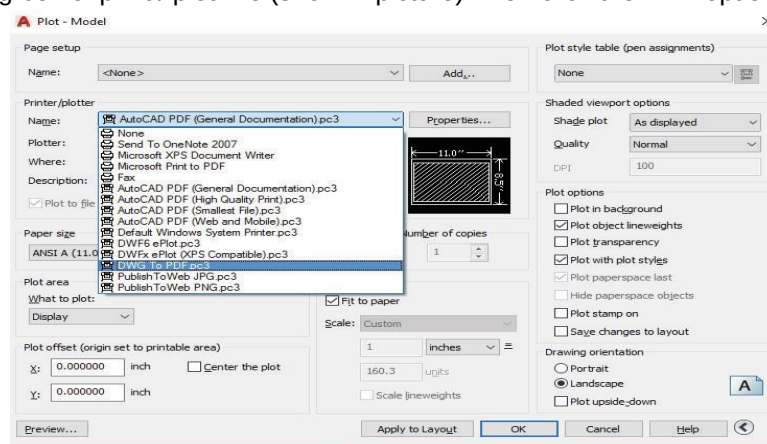
In this unit learner able to print out the Drawing in different formats like

- .PDF
- .JPG etc.

Method of Saving Drawing in PDF

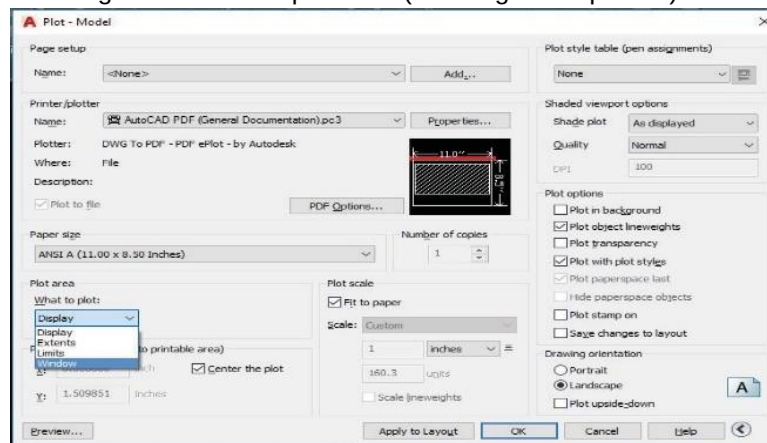
Step 1:

- Applying command print in AutoCAD then show
- The dialog box of print / plot like (show in picture) Then click the PDF option.



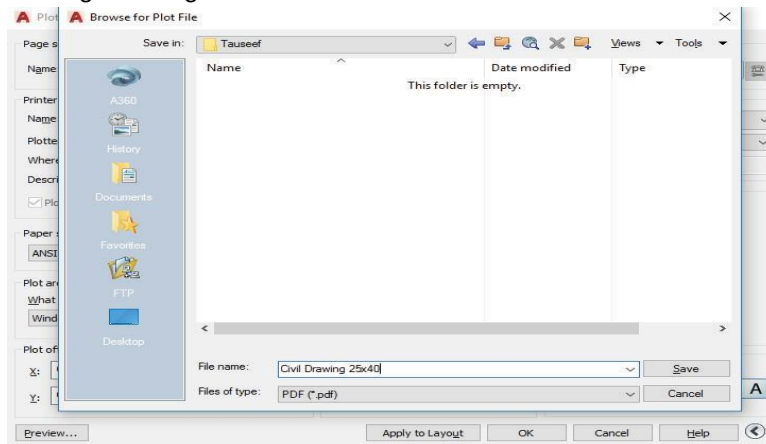
Step 2:

- Select the Drawing with Window option lick (showing in the picture) and click the OK option



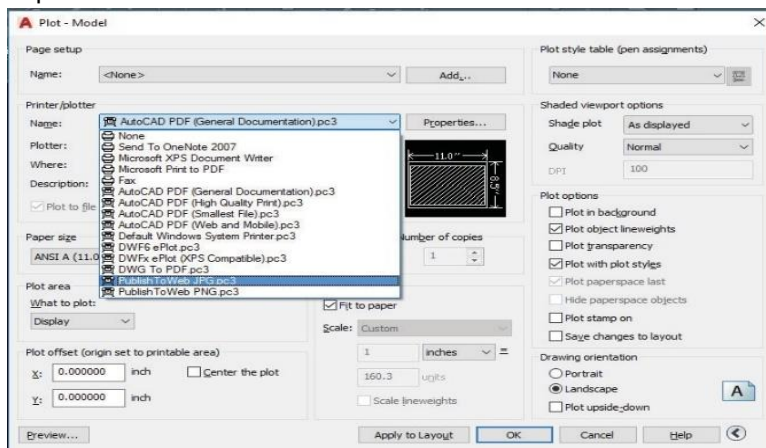
Step 3:

- Then give the path where you want save drawing link (showing in the pictures)
- Method of Saving Drawing in JPG.



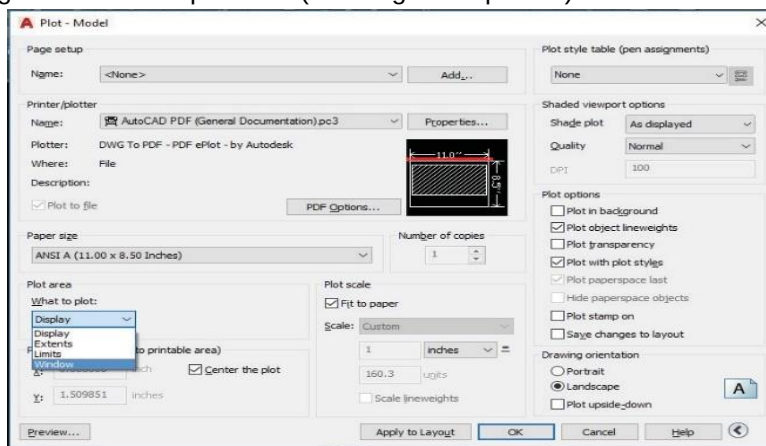
Step 1:

Applying command print in AutoCAD then show the dialog box of print / plot like (show in the picture)
Then click the JPG option



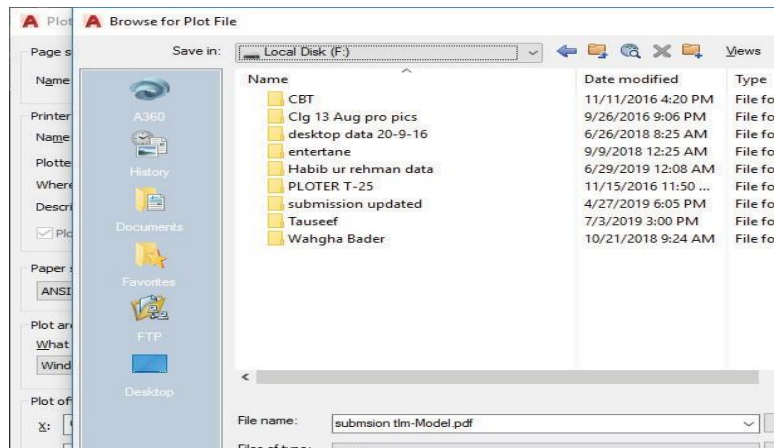
Step 2:

Select the Drawing with Window option link (showing in the picture) And click the OK option



Step 3:

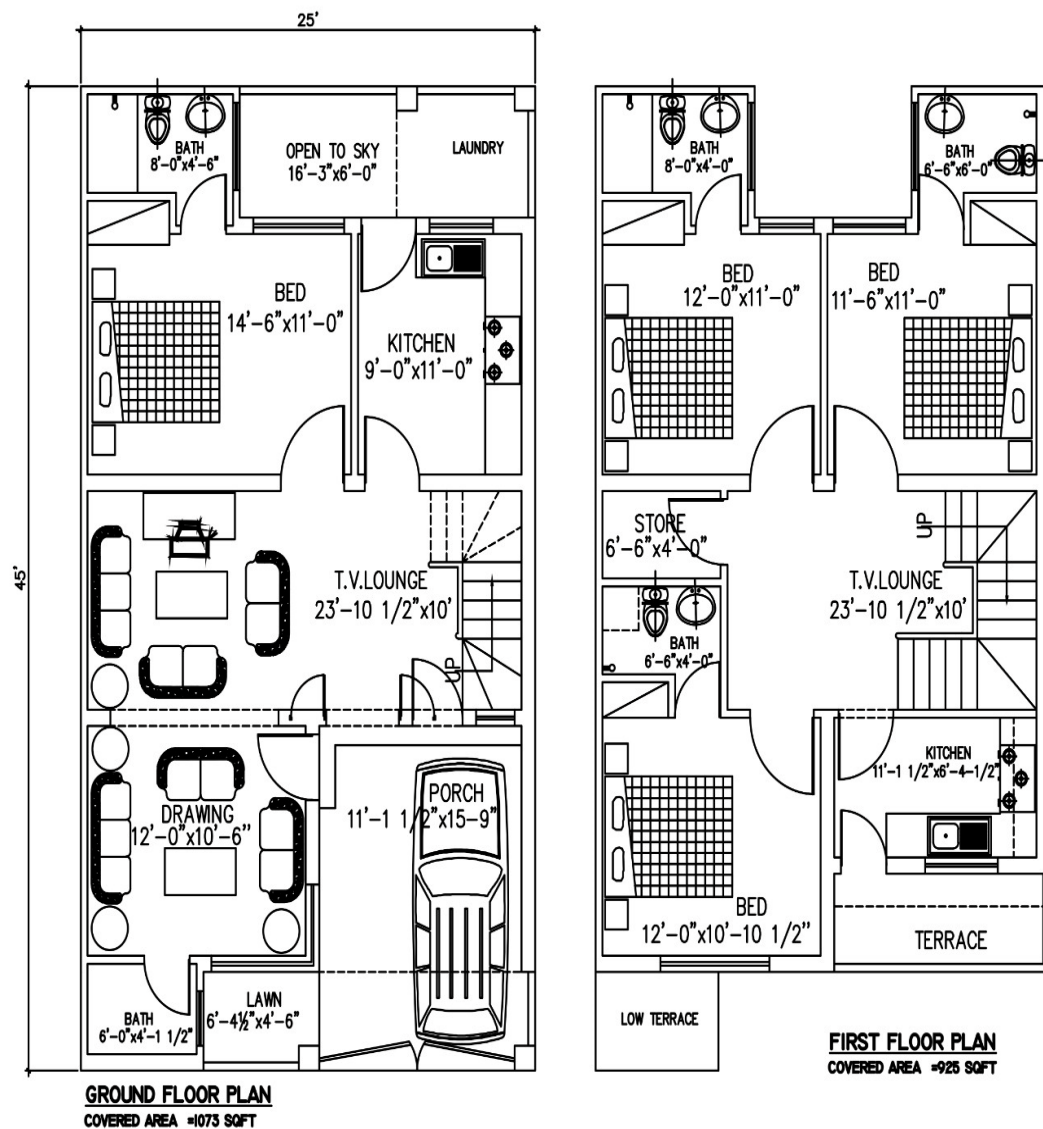
Then give the path where you want save drawing link (showing in the pictures)



Activity 1:

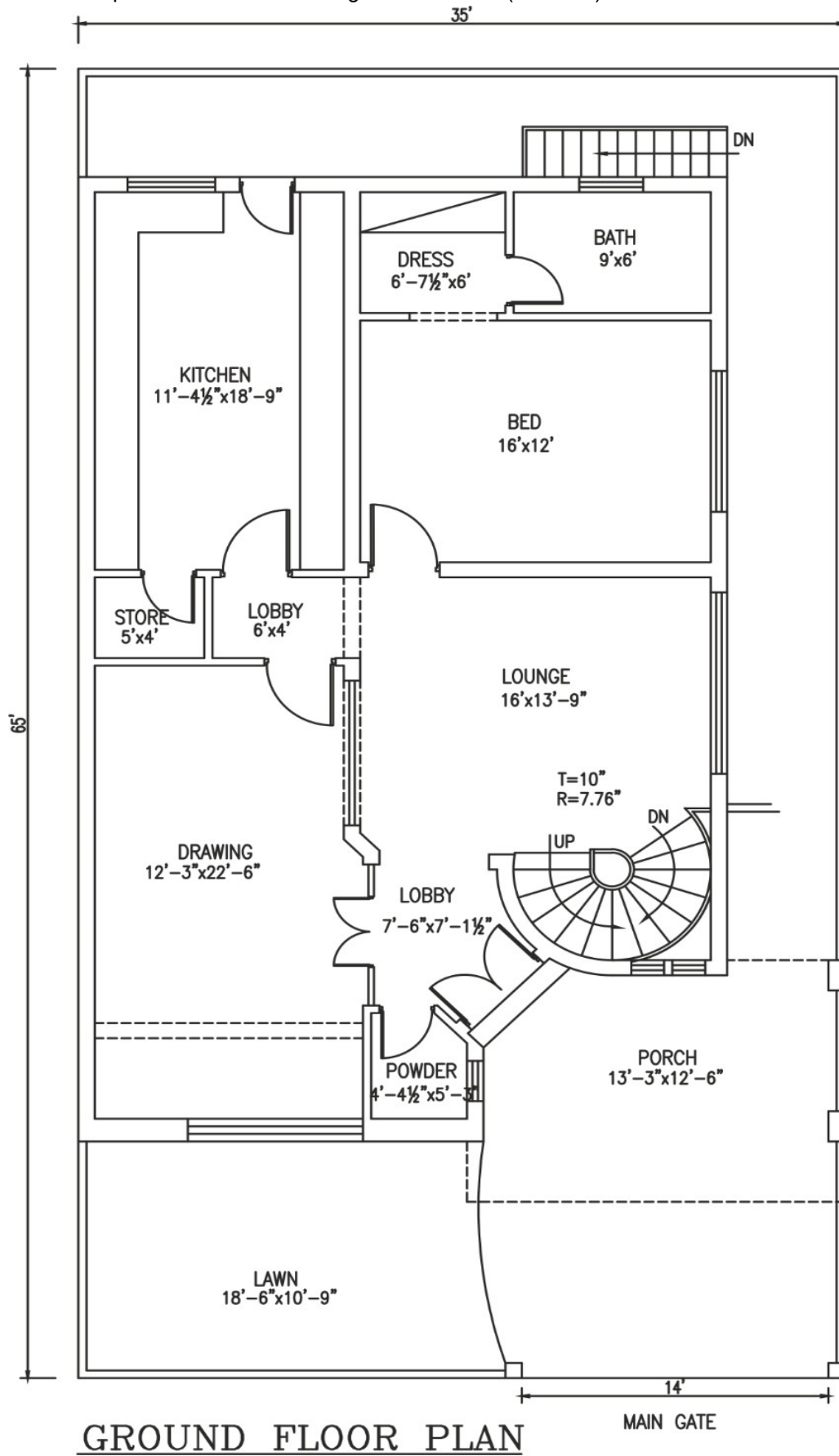
Create 2D 'House Plan' in AutoCAD having dimensions of the plan given below with the following requirements.

Plot size 25' x 45' includes One Master Bed Rooms with attach bedroom, One bed room with attached bath, One kitchen, TV Lounge (As per space), Car Porch (Terrace)



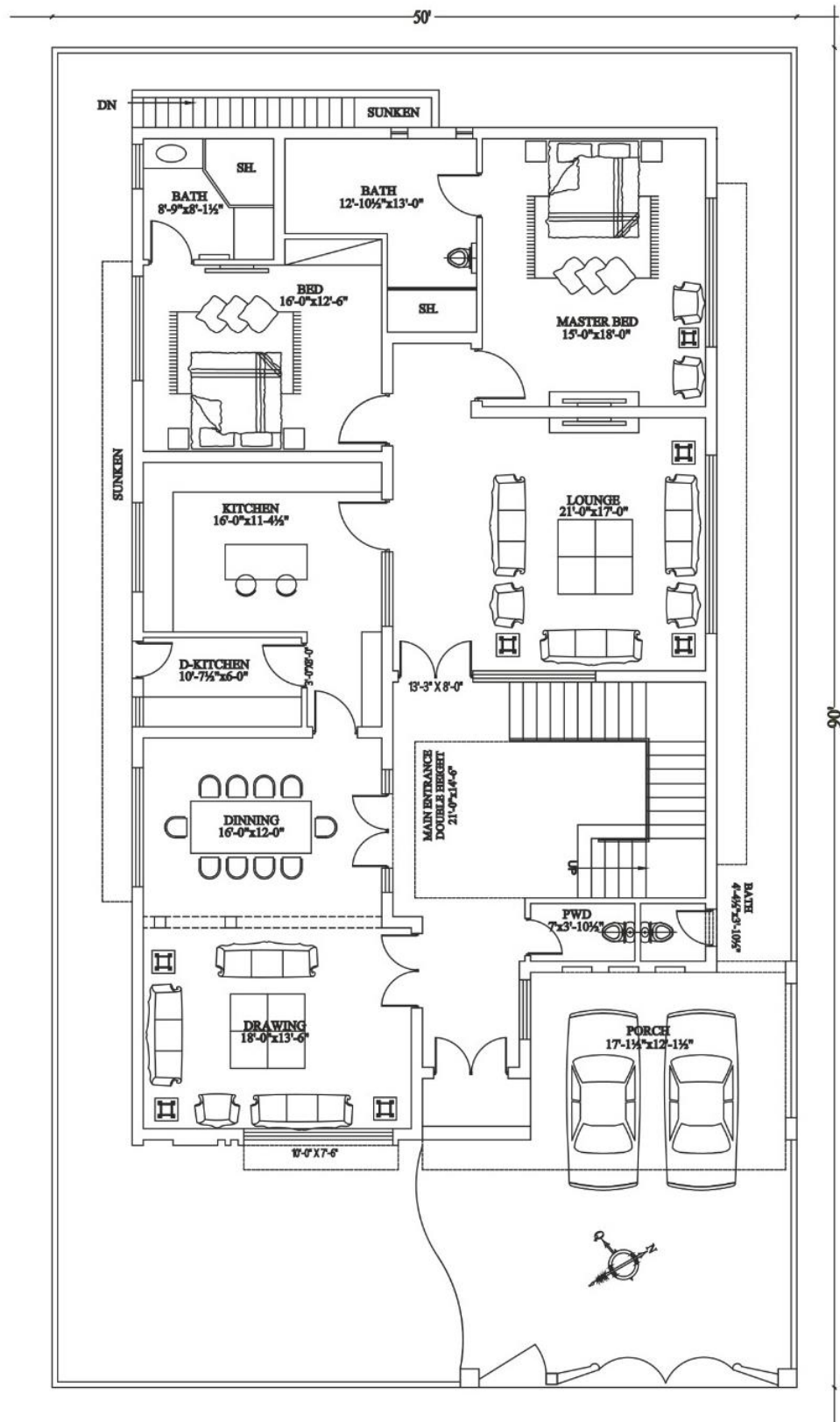
Activity 2:

Create 2D House plan " " in AutoCAD having dimensions of (35' x 65').



Activity3:

Create 2D house plan " " in AutoCAD having dimensions of (50' x 90').



GROUND FLOOR PLAN

Learning Outcome:

After completion of this Learning Unit, trainee will be able to:

- Develop 2D Drawing with given project specification and measurements.
- Perform paperless review
- Use of AI Tools for assistance.
- Plot drawing on scale according to required size & orientation

5.2.1 Types of Technical Drawings

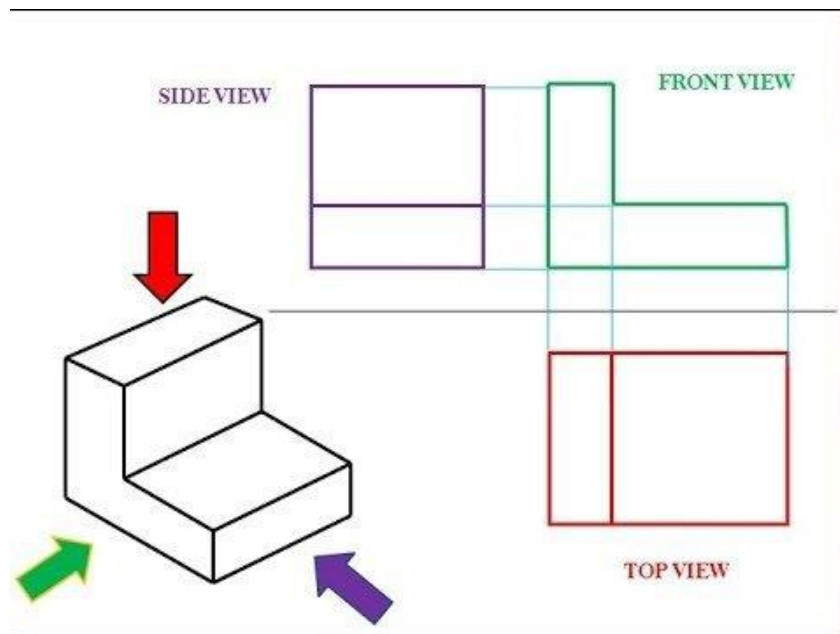
Technical drawings are used in engineering, architecture, manufacturing, and construction to visually communicate the design, specifications, and assembly of objects. Below are the main types of technical drawings:

Engineering Drawings

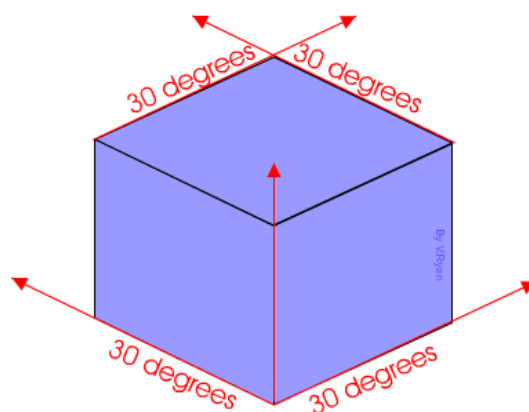
Used in mechanical, electrical, and civil engineering to represent machine parts, circuits, and structures.

Orthographic Projection

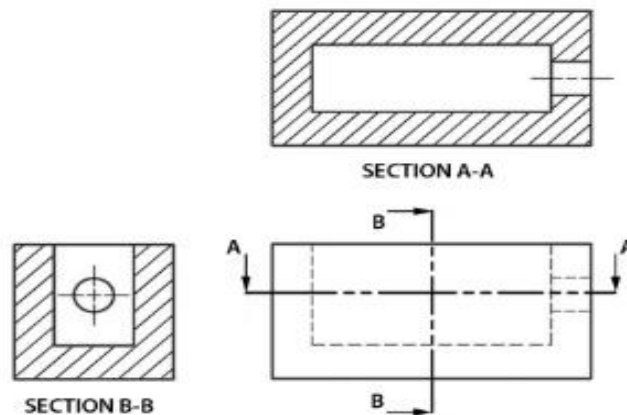
- Shows multiple views (top, front, side) of an object.
- Used in manufacturing and construction.

**Isometric Drawing**

- A 3D representation where all three axes are at 120° angles.
- Useful for visualizing components before production.

**Sectional Drawing**

- Shows internal details by cutting through the object.
- Types: Full Section, Half Section, Offset Section.



Assembly Drawing

- Displays how different parts fit together.
- Includes exploded views for clarity.

Detail Drawing

- Provides dimensions and materials for a single component.

Architectural Drawings

- Used for buildings and structures.

Floor Plan

- Shows a horizontal cut of a building from above.
- Includes walls, doors, windows, and furniture layout.

Elevation Drawing

- Displays the exterior view of a building from the front, side, or rear.

Section Drawing

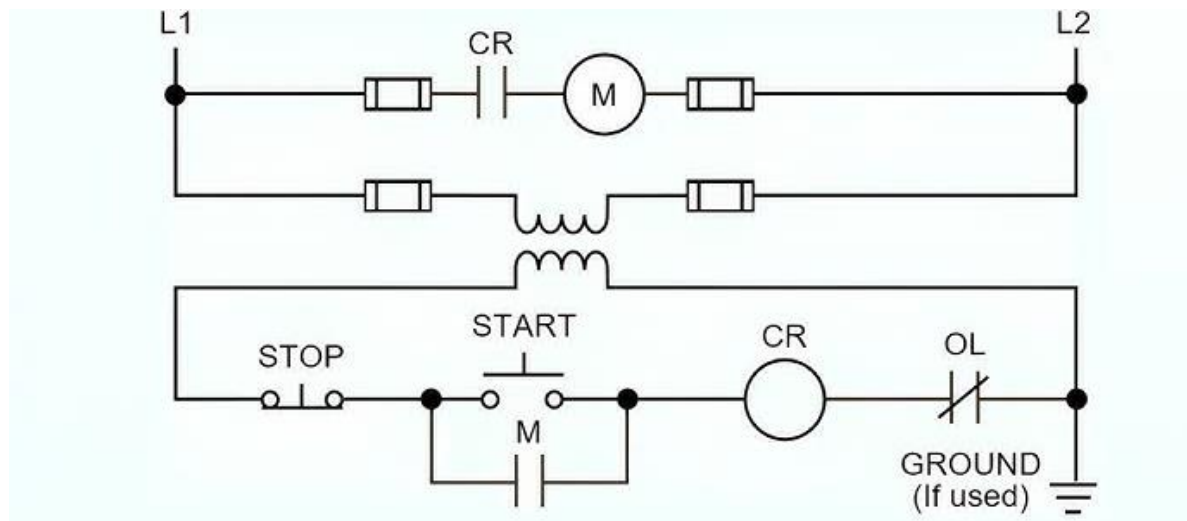
- Cross-sectional view showing internal construction details.

Site Plan

- Shows the building location, landscape, roads, and utilities.

Electrical Drawings

- Used for electrical installations and circuits.



Circuit Diagram (Schematic)

- Represents electrical components using standardized symbols.

Wiring Diagram

- Shows the physical layout of electrical wiring.

Panel Layout

- Displays the arrangement of electrical panels and components.

Structural Drawings

- Used in civil engineering for bridges, buildings, and infrastructure.

Foundation Plan

- Shows footing and foundation details.

Piping and Instrumentation Diagrams (P&ID)

- Used in industries like oil, gas, and chemical plants.

Piping Layout

- Shows the routing of pipes, valves, and equipment.

5.2.2 Printing/Plotting with or without Scale

When printing (plotting) in AutoCAD, you can choose to print to scale (to maintain real-world proportions) or without scale (fit to paper). Below are both methods explained step by step:

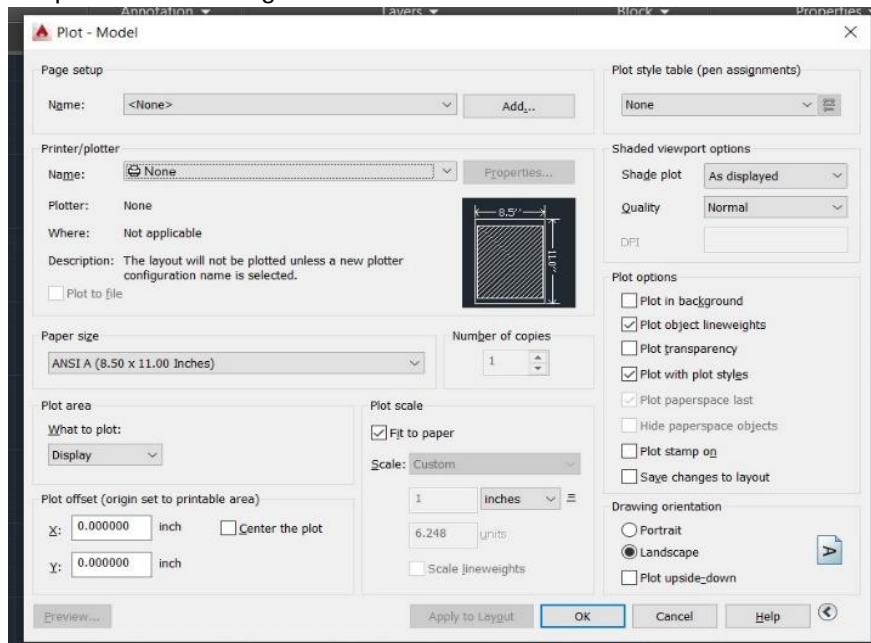
Printing with Scale (Maintains Accuracy)

- Printing to scale ensures that the drawing matches real-world dimensions when printed.

Steps to Plot with Scale:

Open the Plot (Print) Command

- Type PLOT in the command line and press Enter.
- This will open the Plot dialog box.



Select Printer & Paper Size

- Printer/Plotter: Choose the printer or plotter you want to use.
- Paper Size: Select the correct paper size (e.g., A4, A3, A1).

Set the Plot Area

Under Plot Area, choose one of the following:

- Window → Click on the Window button and select the area you want to print.
- Extents → Prints everything in the drawing.
- Layout → Prints everything in the layout tab.

Set the Scale Properly

- Uncheck “Fit to Paper” (If checked, AutoCAD will resize the drawing to fit the sheet, which may not be to scale).
- Set the Plot Scale manually:

1:1 (For full-scale printing, e.g., for manufacturing drawings).

1:50 (For architectural floor plans).

1:100 (For site plans and large projects).

- If your drawing is in millimeters (mm), ensure 1 mm = 1 unit is set.
- If your drawing is in feet/inches, choose the appropriate scale accordingly.

Set the Drawing Orientation

Select Portrait or Landscape, depending on how your drawing should be printed.

Preview and Print

Click Preview to check the output.

If everything looks correct, click OK to print the drawing.

Shortcut Method (Command Line Printing with Scale)

If you prefer to use the command line for quick printing, follow these steps:

- Type PLOT and press Enter.
- Enter Printer Name (e.g., "HP Plotter").
- Enter Paper Size (e.g., A3, A1).
- Type Window, then select the drawing area.
- Enter Scale (e.g., 1:50).
- Press Enter, then OK to print.

Remember

Always use Layouts for precise scaling.

Printing Without Scale (Fit to Paper)

- This method resizes the drawing to fit the selected paper, but the scale will not be accurate.

Steps to Plot Without Scale:

Open the Layout Tab or Model Space

- You can print from either Model Space or Layout Space.

Open the Plot Dialog Box

- Type PLOT and press Enter.
- Select the Printer/Plotter and Paper Size.

Select "Fit to Paper"

- Under Plot Scale, check Fit to Paper.
- This automatically resizes the drawing to fit the sheet.

Choose Plot Area

Under Plot Area, select:

- Window (Select the area you want to print).
- Extents (Prints everything in the drawing).

Preview and Print

- Click Preview to check the output.
- Click OK to plot.

5.2.3 Introduction to AI Tools

ChatGPT can assist you in AutoCAD 2D and 3D drawing, automation, troubleshooting, and learning by providing real-time support, command explanations, and script automation. Below are some key ways ChatGPT can help you improve your efficiency in AutoCAD.

Learning AutoCAD Commands & Shortcuts

ChatGPT can explain AutoCAD commands, shortcuts, and best practices.

Example:

Question: What is the use of the OFFSET command in AutoCAD?

- ChatGPT Answer: The OFFSET command creates parallel copies of selected objects at a specified distance.

How ChatGPT Helps:

- Provides step-by-step instructions for any AutoCAD command.
- Suggests keyboard shortcuts for faster work.

AutoCAD AI-Powered Drafting Assistance

- ChatGPT can guide you in setting up layers, dimensions, blocks, and layouts.

Example:

- Question: How can I create a title block in AutoCAD?
- ChatGPT Answer: Use the RECTANGLE and MTEXT commands, then save it as a BLOCK for reuse.

How ChatGPT Helps:

- Provides ready-made AutoCAD templates (title blocks, symbols, etc.).
- Gives layering best practices to keep drawings organized.

Troubleshooting AutoCAD Errors

- ChatGPT can help fix common AutoCAD errors.

Example:

- Problem: *AutoCAD* is not snapping to points properly.
- Solution: Enable “OSNAP” by typing OSNAP and selecting the required snap options.

How ChatGPT Helps:

- Provides command-based solutions for error fixing.
- Suggests system variable adjustments to improve performance.

AI-Powered Drawing & 3D Modeling Assistance

- ChatGPT helps with 2D drafting, 3D modeling, and rendering commands.

Example:

- Question: How do I create a 3D model from a 2D drawing?
- ChatGPT Answer: Use EXTRUDE and PRESSPULL commands to convert 2D shapes into 3D solids.

How ChatGPT Helps:

- Guides on converting 2D to 3D in AutoCAD.
- Explains rendering and visualization settings.

AI-Based Design Optimization & Best Practices

- ChatGPT suggests the best AutoCAD workflows for efficiency.

Example:

- Question: How to organize layers in AutoCAD for a building plan?
- ChatGPT Answer: Use separate layers for walls, doors, windows, furniture, and electrical components.

How ChatGPT Helps:

- Provides CAD standards for architectural and engineering drawings.
- Suggests file management best practices for large projects.

5.2.4 Importance of a Digital Portfolio

A digital portfolio is an online collection of a person’s work, skills, and achievements, often used by professionals, students, and creatives to showcase their expertise. It serves as a modern resume that highlights skills, experience, and accomplishments in a visually appealing way.

- **Professional Branding**
A digital portfolio helps build and maintain a professional online presence, allowing individuals to stand out in competitive industries. It reflects expertise, creativity, and experience.
- **Easy Accessibility**
Unlike traditional portfolios, a digital portfolio can be shared globally via a link. Potential employers, clients, or collaborators can view it anytime, increasing opportunities.
- **Showcasing Skills & Experience**
A well-organized portfolio provides a clear representation of a person’s skills, projects, and achievements, making it easier for recruiters or clients to assess suitability for a job or project.
- **Increases Credibility**
Having a portfolio with real work samples builds trust and credibility. Employers or clients can see past projects and verify an individual’s capabilities before making hiring decisions.
- **Better Than a Resume**

A resume lists qualifications, but a digital portfolio visually demonstrates skills with real-world examples like images, reports, designs, or coding projects.

- **Useful for Multiple Industries**

Whether you're a graphic designer, engineer, teacher, writer, photographer, or developer, a digital portfolio is beneficial for showcasing work and attracting opportunities.

- **Helps in Networking & Job Search**

A portfolio linked to social platforms (LinkedIn, personal website, or job portals) can increase visibility and help connect with potential employers or clients.

Activity 1:

Practice to draw set of 2D Drawings including Plan, working plan, section, elevation, legend, schedule, areas & measurements in AutoCAD.

Activity 2:

Print the completed submission plan with the following requirements

- Plotter: XPS Document Writer
- Paper Size: A3 /A4
- What to Plot: Extents
- Plot scale: Fit to Paper
- Plot offset: Center
- Drawing Orientation: Landscape/Portrait

SUMMARY

This module equips learners with the essential skills to create accurate and detailed 2D drawings using AutoCAD. It covers key concepts such as drawing setup, basic and advanced drawing tools, layer management, annotation, dimensioning, and plotting. Through hands-on practice, students develop proficiency in drafting industry-standard technical drawings, enhancing their ability to communicate design ideas clearly and effectively in a professional environment.

FAQs:

Q1. What is AutoCAD?

Ans. AutoCAD is a CAD (Computer-Aided Design) software used for creating engineering drawings and designs.

Q2. What is the shortcut for saving a file in AutoCAD?

Ans. Use CTRL + S or type SAVE command.

Q3. What is the default file format of AutoCAD?

Ans. The default file format is .DWG (Drawing).

Q4. What is the shortcut for the Line command?

Ans. Type L and press Enter.

Q5. Which command is used to draw a circle?

Ans. The C command is used.

Q6. What is the shortcut for the Offset command?

Ans. The O command is used.

Q7. What is the difference between Trim and Extend?

Ans. TRIM removes extra parts of a line, while EXTEND lengthens a line.

Q8. What is the shortcut for the Mirror command?

Ans. The MI command is used.

Q9. What is the shortcut for the Copy command?

Ans. The CO or CP command is used.

Q10. What is the shortcut for the Rotate command?

Ans. The RO command is used.

Q11. What is the function of the Scale command?

Ans. The SC command is used to increase or decrease the size of an object.

Q12. Why are layers important in AutoCAD?

Ans. Layers help organize different objects by categorizing them.

Q13. How to open layer properties?

Ans. Use the LA command.

Q14. What is the function of Grid and Snap?

Ans. The grid provides a reference, and Snap helps in placing objects at exact points.

Q15. Which command is used to write text?

Ans. DT (Single Line Text) and MT (Multi-Line Text) commands are used.

Q16. Which command is used to add dimensions?

Ans. The DIM command is used.

Q17. What is the function of the Hatch command?

Ans. The Hatch command is used to apply patterns or shading to an object.

Q18. What does the Leader command do?

Ans. The LE command attaches text with an arrow.

Q19. What is the difference between Polyline and Line?

Ans. A polyline is a connected segment, whereas a simple line consists of separate segments.

Q20. What is the shortcut for the Pan command?

Ans. The P command is used.

MCQs:**1. Which command convert discrete 2D 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 selected project, you will choose to regulate what to plot?

- a. Display b. Extents c. Limits d. Window

4. 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

5. What is the function of the LINE command in AutoCAD?

- a. To draw a polygon b. To draw a straight line between two points
c. To draw an arc d. To create a 3D model

6. What does the OFFSET command do?

- a. Moves an object from one place to another
b. Creates a parallel copy of an object at a specified distance
c. Rotates an object
d. Extends an object

7. Which command is used to trim excess parts of an object?

- a. Extend b. Trim c. Erase d. Move

8. How can you draw a circle with a specific radius?

- a. Use the CIRCLE command and specify the center and radius
b. Use the ARC command
c. Use the ELLIPSE command
d. Use the RECTANGLE command

9. What is the purpose of using Layers in AutoCAD?

- a. To divide the drawing into sections for better organization
b. To make a 3D model
c. To apply colors only

d. To increase the file size

10. Which command is used to add dimensions in AutoCAD?

- a. Measure b. Dim Length d. Scale

11. What is the function of the TEXT command?

- a. To add textual information in a drawing b. To create a table
c. To label blocks d. To delete text

12. Which command is used to make a copy of an object in AutoCAD?

- a. Copy b. Mirror c. Duplicate d. Move

13. What is the minimum allowable number of layers in a drawing?

- a. 0 b. 5 c. 1 d. 2

14. How many SNAP points does an object have?

- a. 1 b. 4 c. 5 d. Depend on object

15. Which one is AutoCAD Extension?

- a. Dwg b. Dxf c. Dot d. dws

True Answer

1.	C	2.	C	3.	D	4.	D
5.	B	6.	B	7.	B	8.	A
9.	A	10.	B	11.	A	12.	A
13.	C	14.	D	15.	A		