

B.Com - III(Vocational Course) – Vth Semester w.e.f session 2016-17

(Computer Application)

Paper : A 5.05 Computer Aided Drafting & Advanced Topics in Computer-I

Time: 3 Hours

Max marks : 70

Practical : 30

Note: - The Examiner shall set nine questions in all covering the whole syllabus. Question No. 1 will be compulsory covering all the units and shall carry 7 small questions of two marks each. The rest of the eight questions will be set from all the four units. The Examiner will set two questions from unit out of which the candidate shall attempt four questions selecting one question from each unit. All the questions shall carry 14 marks each.

Unit – I

Introduction: CAD/CAM Defined, Product cycle and CAD/CAM, Automation and CAD/CAM. Computer Technology: Introduction, CPU, Types of memory, Input/Output, Data representation, Computer Programming Languages, Operating the computer System, Introduction to Mini computers, Micro computers and programmable controllers.

Unit – II

Computer- Aided Design: Fundamentals of CAD Introductions, Design Process, application of computers for design, Creating the manufacturing Data base, Benefits of Computer – Aided Design with examples, Hardware in Computer – Aided Design: Introduction, Design workstation, Graphics terminal, Operator input devices, Plotters and other output devices, CPU, secondary storage.

Unit – III

Computer Graphics Software and Data Base : Introduction software Configuration of a Graphics system, Functions of a Graphic Package, Exchange of CAD Data; Role of Multimedia;

Unit – IV

Data warehousing Components –Building a Data warehouse – Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata.

Practical (Examination will be held in 6th semester):
Prepare a practical report on SQL queries

Max Marks 30

Books Suggested:

1. CAD/CAM, M.Grover & E-Zimmers Peason Education.
2. Peason Education.
3. Indroduction to Computer Graphic and Multimedia, Anirbara
4. Ham & kambller

CAD

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CAD

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11	Draw Circle and Make Multiple Copies.	
12	Make a Triangle.	
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Unit I

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Design : →

Design is the human power to conceive, plan and realize products that serve human beings in the accomplishment of any individual or collective purpose. Design is usually considered in the context of applied arts, engineering, architecture and other creative endeavors.

Design is used both as a noun and a verb.

As a verb, "to design" refers to the process of originating and developing a plan for a product, structure, system or component.

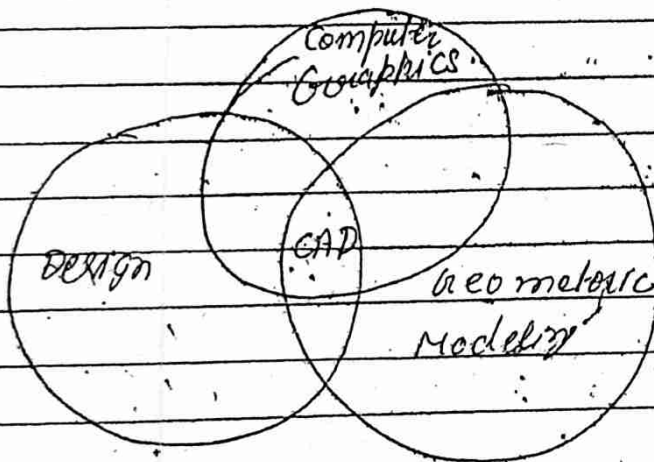
As a noun, "a design" is used for both the final plan or the result of implementing that plan.

CAD/CAM : →

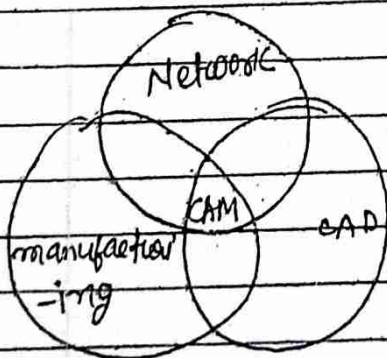
CAD stands for computer aided design. CAD is the designing software. CAD refers to computer software that is used to design ~~drawings~~ a product. CAD involves the use of computer hardware and graphics software to generate design drawings. Modern CAD equipment enables the designer to quickly produce very accurate and realistic images of products to be manufactured. CAM stands for computer aided manufacturing (CAM). CAM is a system of automatically producing

digital model is then inputted to the ~~CAM~~ software package. The CAM software needs to know the physical shape of the product (CAD model) before it can compose a proper set of fabrication. CAD/CAM software is most often used for manufacturing the design of the product and manufacturing product.

CAD is a subprocess of Design process



The CAM process is a subset of manufacturing process.



CAD Technology = Design Technology + Computers (HW/SW)

Reason for using CAD System: →

There are many good reasons for using a CAD system to support the engineering design function:-

1. To increase the productivity.
2. To improve the quality of design.
3. To uniform design standard.
4. To create a manufacturing database.
5. To eliminate inaccuracy cause by handle topic of drawing and inconsistency between drawings.

Introduction to CAM: →

CAM stands for Computer Aided manufacturing. Computer Aided manufacturing is defined as the effective use of computer technology in manufacturing, planning and controlling the product. CAM is most closely with function in manufacturing Engineering and controlling a product is the combination of CAD and CAM.

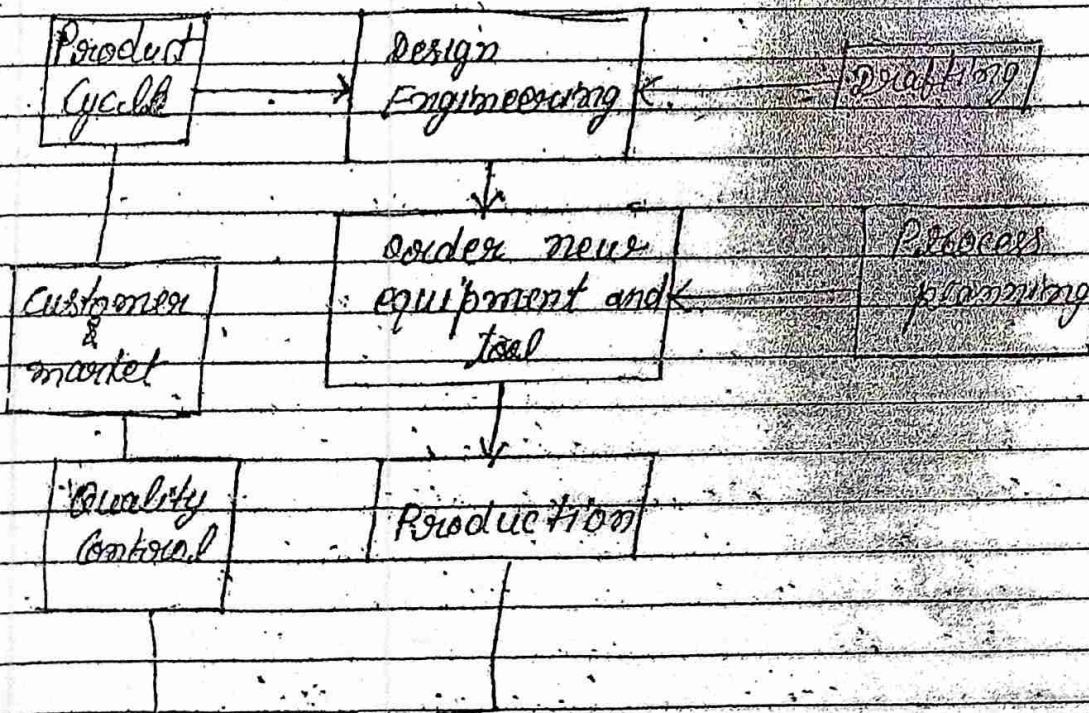
and it make a system CAD/CAM system.

This combination allow the transfer of information from the design into the stage of planning for the manufacturing of a product without the need to re-enter the data on geometry manually. The data base developed during CAD is store. Then it is process further by CAM in.

into the necessary data and instructions for operating and controlling production machinery material handling and automated testing and inspection for product quality.

The product cycle and CAD/CAM :-

When we produce a product we must accomplished many activities. It means when we design and manufacture any product we examine the various activity and functions that must be followed. These activities and functions are referred as product cycle. A diagram showing the various steps in the product cycle is presented as:-



Product Cycle Design and Manufacturing

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Activities and Function in Production Cycle are as follows: -

1. Customer and Market.
2. Drafting (Design Engineering)
3. Process planning - order new equipment and tool.
4. Process Scheduling - Production.
5. Quality Control.
6. Back to the Customer and Market.

Now we will explain these activities in detail one by one.

1. Customer and Market : →

The production cycle is driven by customer and market which demand the product. The reason for the production of a product is realistic thinking of the industrial and customer and market rather than one monolithic market dependent. It is not also dependent on a particular customer group. The product is manufactured by different firms.

2. Design Engineering : →

It is the second activity of the product cycle. After the customer, market and industry thinking for a product we do Design engineering or drafting for the production of a product. This concept more of define analysis improve and translated into a plan for a product through the design.

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engineering process. This plan is documented and drafting a set of specifications indicating how the product should perform. Now we will follow next step after this specification.

3. Process planning : →

This step involves the manufacturing of the product. A process plan is perform which specify the sequence of production operations required to make the product. This is the plan that commit the company to the manufacture of quantity of the product by certain date. And product get made with in these dates.

4. Production scheduling : →

After the process planning the product goes into production. follow by the quality testing and then the production is done.

5. Quality Control : →

After the production of the product the quality testing is done that it fulfill the requirement or not.

6. And After the quality testing the product is delivered back to customer. Computer are used in production to monitor and control the manufacturing operation. In quality control computer are used to perform inspection & perform test on the product and its components.

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CAD → CAD stands for computer Aided Design.

Automation and CAD/CAM →

Automation is an industrial process, using control system such as computers to control industrial machinery and processes. Automation replace humans as workers and automation reduces the need for human sensory and mental requirements. Since its all controlled by computers. Computers can be programmed in such a way that it does the same job over and over again without flaws. So the process can go nonstop 24 hours and 7 days. It make it faster easier and cheaper to manufacture things. Many things we use daily ~~mass~~ are now mass produce and are made cheaper and this is done only due to automation.

Contribution of CAD/CAM to an automated production system →

System such as CAD/CAM can contribute to an automated production system by linking to the manufacturing equipment which is likewise controlled by a computer. CAM for example would offer a better controlled over the equipment, than a human operator. It can also reduce labor costs. Also since the machines are following the exact CAD drawing, so there is a lower chances of flaws to occur with the finished product. Designers can use

it to create product much faster and it allows them also to test if the product is feasible. Furthermore it allows the production process to lower waste amount.

There are some positive as well as negative points of automation. These are as follows:-

Positive : →

- ① Tedious and time consuming jobs are now being performed by machines rather than workers.
- ② Improves health and safety.
- ③ Increase production.
- ④ Speed up the process.
- ⑤ Replaces unskilled workers that make faults.

Negative : →

Large

- ① Extreme industrialisation.
- ② Less social interaction in the workplace, due to fewer employees.
- ③ The number of workers needed has been cut sharply.
- ④ The loss of worker expertise.
- ⑤ The loss of overtime pay.
- ⑥ Makes life dependent on new technology.
- ⑦ Training in the new areas of electronics, computer engineering and maintenance of system is now needed.

Automation has improved the range of products available to consumers due to the ease and simplicity of producing a product.

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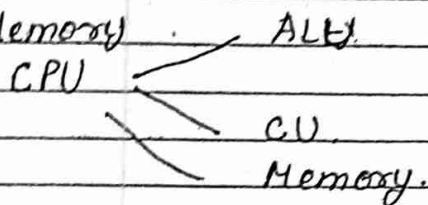
CPU : →

CPU stands for Central processing unit. CPU is the brain of computer. All the working in a computer system depends upon the CPU. It is the main part of the computer system. CPU looks like a box. There are ~~two~~ three subparts of the CPU :-

① ALU

② CU

③ Memory



① ALU : →

ALU stands for arithmetical logical unit. As the name suggests, ALU is the part which is responsible for all the operations. All the operations performed in our computer system are carried out in this unit of the computer system.

② CU : →

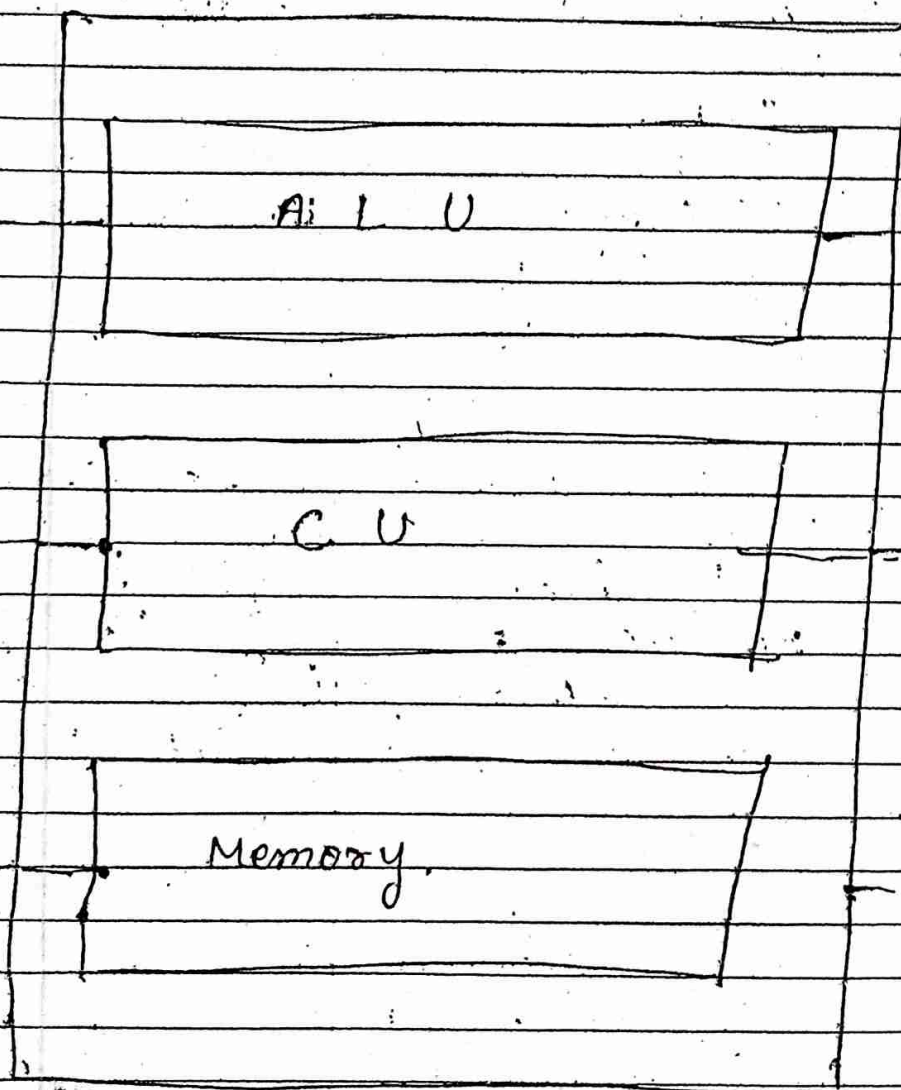
CU stands for the control unit. The control unit is the unit of the computer system which controls all the processing in the computer system. Control unit extracts instructions from memory and decodes them, then calling on the ALU when necessary.

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CPU



• Central Processing Unit

② Memory : →

Memory is the space in the computer system where all the data and instructions are stored before and after the processing. The memory is of mainly two types primary memory or main memory and second the secondary memory or permanent memory. Primary memory is not permanent. This memory is used for the processing only. Data inside the primary memory is not permanent, it goes out when the computer is switch off. But the data in the secondary memory is permanent.

Computer Memory : →

Memory is the part or space where the data is stored. It is the internal storage area in the computer system used to either temporarily or permanently store data or instructions to be process. There are 4 basic types of computer memory: -

1. Cache memory.
2. RAM memory.
3. Virtual Memory.
4. Hard Drive memory.

① Cache memory : →

Cache memory is also called as the CPU memory. A cache memory is smaller, easy access, temporary memory. It stores copies of data from frequently accessed memory locations for quick access.

② RAM memory : →

Computer RAM is the best-known form of memory of your computer. Every file or application open is placed in RAM. In RAM any information the computer need or use become the part of a continuous cycle where the CPU request data from RAM process. When the data is used for the processing then it come into the RAM and the processing is done on this data. And after the processing the data is back placed into the permanent storage. But in the RAM memory data is not stored permanently, it is temporary stored.

③ Hard Drive : →

A Hard drive is the form of computer memory where the data is stored permanently. The data is stored before and after the processing is placed into the hard drive. The data is stored permanently. On computer running with microsoft windows, the hard drive is often called C-drive. The size of the hard drive is measured in giga-byte. Because the data in the hard drive memory is stored permanently, so it is called as the secondary memory type.

④ Virtual Memory : →

As the name suggested the virtual memory is the memory which actually does not exist in reality, but it

is just our imagination of memory. Virtual memory came into place where the applications are too large for the RAM to handle.

The operating system use the hard drive to temporarily store information and take it back when need. We use the hard drive memory part as a RAM memory part. But this is normally a slower than actual RAM. And so can possibly degrade the performance of the system if it is used heavily.

Input / Output : →

Input : →

Input is the data which we give to our computer system for the processing. The data to the system is given through the input unit. i.e. we use some type of input devices for giving the input to our system. We used commonly mouse, keyboard, scanners, joystick, light pen and many other devices for giving the input to our computer system. We can give the input in two positions. One when the computer system is online and second when the system is offline. Depending upon these two type of inputs position we use two type of input devices as follows : —

- ① On-line input devices.
- ② Off-line input devices.

① On-line input devices :- →

On-line input devices are capable to interact directly to the computer system. These devices operates with the computer for carry out the tasks when our computer system is online.

② Off-line input devices :- →

These devices refers to the equipment not connected to the computer system directly. These devices don't directly interact with the computer system. These devices carry out the tasks under their own control. There are various types of offline devices.

Output :- →

Output is the data which the users get from the computer system after the completion of the process. The data is entered through the input devices & the computer system process on this input and give the output to the user through the output unit. We use many output devices for taking this output from the system. We use the following output devices for taking the output.

Hardcopy and Output Devices :- →

- ① Flat bed plotters.
- ② Driven plotters.
- ③ Printers.

DMP (Dot matrix printers)
laser
inkjet

Softcopy output device → monitor.

(a) Data Representation : →

Data Representation refers to the methods used internally to represent information stored in a computer. Computers store lots of different type of information as text, numbers, sound or graphics of many variety.

Data Representation in CAD/CAM : →

Data Representation in CAD/CAM can be done by the many different ways. The data representation in CAD/CAM is quite different from all other systems. Data representation can be done in different ways as follows : →

- ① Wireframe representation.
- ② Surface representation.
- ③ Constructive Solid Geometry (CSG)
- ④ Boundary representation (B-rep)
- ⑤ Hybrid representation.

① Wireframe representation : →

A wireframe model is represented by defining edges and points. An edge may be a line or a curve. This representation is natural for a designer who is familiar with machine drawings since it is the lines and curve in a drawing which define 3D shape. A wireframe model is simple to deal with in a computer with small storage space and quick access time.

② Surface representation : →

A surface model is

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represented by edges and points, as in a wireframe model, but with additional faces which fill the space between the edges and points. Each face is described by a surface, which can be elements of quadrics like cone, cylinder, sphere, or a set of splines.

(3) Constructive Solid Geometry (CSG) : →

With CSG, solids are described as combination of simple (rules) primitives or other solids in a series of Boolean operations. This is called building block construction representation.

$0+0 = \text{False}$
any number addition = 1 True

(4) Boundary representation (B-Rep) : →

Boundary representation can be divided in three classes: faceted, elementary and advanced B-Rep. B-Rep models represent a solid indirectly by a representation of its bounding surface. A B-Rep solid is represented as a volume contained in a set of faces together. It defines the relationship between the faces.

(5) Hybrid representation : →

Modern CAD-system almost always use some hybrid form of representation which is a combination of the basic variations. Hybrid representation come into because different representations have their advantages and drawbacks for different application areas.

Computer Programming Language : →

In general there are 3 basic level of computer programming.

Language : These are as follows : —

- ① Machine Language
- ② Language Assembly Language (middle level language)
- ③ High level language.

① Machine Language : →

Our computer understands 0 and 1. This representation in the form of 0 and 1 is called as binary form. Therefore program and the data have to be written in binary code. The binary coded instructions that computer can understand are called machine language or machine code. The language used by computer is called machine language. A machine language instruction consist of two parts namely the operation code and the operand. The operand may be a memory address, a device address or data in machine language programming. A machine language is machine dependent. It can be recognized and understood only by the computer for which it was designed. Programming in machine language is complicated and time consuming.

② Assembly Language : →

A language consist of instructions is called an assembly language. Assembly language are consider to be low level language. The programmer must be very knowledgeable about the computer.

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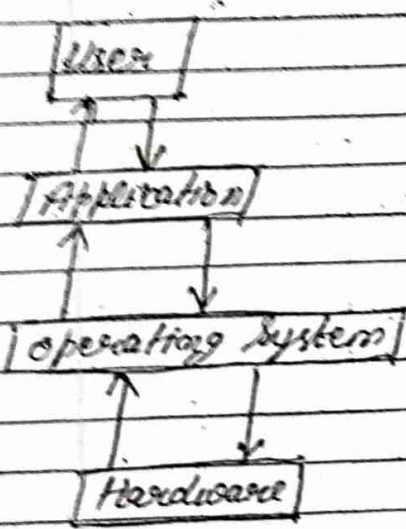
Low level language are the most efficient in term of fast execution on the computer. Programs written in assembly language are not directly executable by the computer. Assembly language program must be converted into machine language before the computer can execute them. This conversion from assembly language to machine language is done by a program called an assembler. The assembler take the assembly language program perform the necessary conversion and produce the new program. Assembly language are hardware dependent because they differ from one system to other.

⑧ High level Language : →

Both machine language and assembly language are machine oriented. High level language are problem oriented. High level language are not machine dependent. A high level language program written on one computer can be run on another computer. The most important advantage of high level language is that it is not necessary for the programmer to be familiar with machine language. A program is written as an english like algorithm to solve a problem like assembly language. High level language must also be converted into machine code. A special program called a compiler achieve this and convert it into low level code such as machine language. A compiler is able to detect statement errors in the program and corresponding error message are printed. The most common high level language used for business and engineering application are Fortran, Basic, Cobol etc.

Operating the Computer System: →

Operating System (OS) is a software that manages computer hardware and software resources and provides common services for computer programs. The operating system is an essential part or component of the system software in a computer system. Application programs require an operating system to function. Operating system acts as an interface between the user and the hardware as shown below: —



Operating system.

Functions of operating system: →

- ① Process Management
- ② Memory Management
- ③ File Management
- ④ Security Management
- ⑤ Command Interpreter

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① Process Management : →

By process management os manages many kinds of activities as :-
1. All process from start to shut down.
2. Creation and deletion of user and system processes.

② Memory Management : →

The major activities of an operating system regard to memory management are :-

1. Decide which process are loaded into memory and when memory space will be available.

③ File Management : →

The file management system allows the user to perform such tasks :-

- ① Creating files and directories
- ② Renaming files.
- ③ Copying and moving files
- ④ Deleting files.

④ Security Management : →

By security management os manages many tasks such as :-

1. Alert messages.
2. Dialogue boxes.
3. Firewalls.
4. Passwords.

⑤ Command Interpreter : → A command interpreter is an interface between system and file user. There are two types of interpreter.
① command line ② Graphical user interface.

We use computers of many types as :- Batch, multiplex, real time, multiprogramming, distributed, multiprocessing os etc.

Minicomputers and Microcomputers :- →

Computers can be classified into various types depending upon the following criteria :- →

- (1) According to Purpose.
- (2) According to Technology.
- (3) According to size and Storage capacity.

(1) According to purpose :- →

- (a) General purpose computers.
- (b) Special purpose computers.

(2) According to technology :- →

- (a) Analog computers.
- (b) Digital Computers.
- (c) Hybrid Computers.

(3) According to size and Storage Capacity :- →

- (a) Micro Computers.
- (b) Mini Computers.
- (c) Mainframe Computers.
- (d) Super Computers.

Microcomputers :- →

Microcomputers is the one type of computer according to the size and storage capacity. Micro computers are digital computers. These computers use one microprocessor as its CPU. So microcomputers are

called personal computers. For example IBM PCs. The characteristics of microcomputers are as follows: →

- ① They use very little power.
- ② They need very less air-conditioning.
- ③ The smallest category of computers consisting of a micro processor, storage and I/O element is known as micro computers.
- ④ These systems are characterized by their main memory size that ranges from 256KB to 8MB. Their word length is 8 or 16 or 32 bits.
- ⑤ Maximum speed of microcomputers is upto 1 million bytes per second.
- ⑥ They are stable and reliable once tested and prove.
- ⑦ They can work 4 years without any problem.
- ⑧ They are generally single user.

② MINICOMPUTER : →

Minicomputers are medium scale computers in the sense: they are faster than micro computers but slower than mainframe computers. Example of minicomputer is VAX, DEC micro. The characteristics of minicomputers is as follows:

1. They are design to serve multiple users.
2. They are more powerful than a micro computer.
3. They usually employ micro processor both for data storage as well as data manipulation.
4. They can accept and transfer data from I/O device at the maximum speed at one million byte per second.

MiniComputers achieve fast processing speed by high speed buffers.

6. They are more expensive than microcomputers.

7. They are popular among research and business organisation.

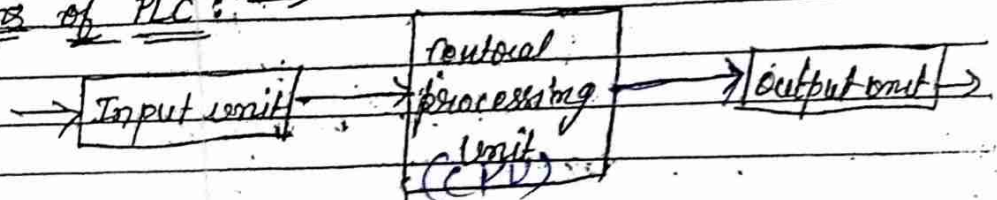
PROGRAMMABLE CONTROLLERS : →

Program Controller is also called as Programmable Logic Controller (PLC). PLC is an industrial computer control system that continuously monitors the state of input devices and make decisions based upon a custom program to control the state of output devices.

Almost any production line, machine function or process can be greatly enhanced using this type of control system. However, the biggest benefit in using a PLC is the ability to change and duplicate the operation or process while collecting and communicating vital information. Another advantages of PLC system is that it is modular. That is, you can mix and match the types of input and output devices to best suit your application.

The first programmable logic controllers were designed and developed by Modicon. These controllers eliminated the need for growing and adding additional hardware for each new configuration of logic. The first PLC model, was invented by Dick Morley in 1969.

Functions of PLC : →



The central processing unit, the CPU, contains an internal program that tells the PLC how to perform the following functions: →

- execute the control instructions contained in the user's programs -
- Communicate with other devices -
- Perform Housekeeping activities such as communications.

How does a PLC operates : →

1) Input Scan : →

- Detects the state of all input devices that are connected to the PLC.

2) Program Scan : →

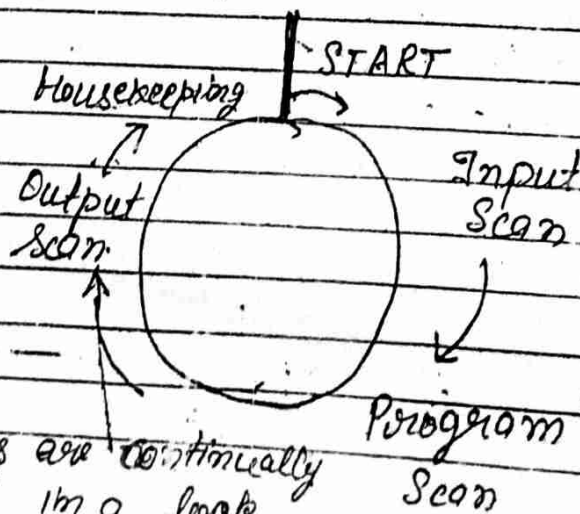
- Executes the user created program logic

3) Output Scan : →

- Energizes or de-energizes all output devices that are connected to PLC.

4) Housekeeping : →

- This step includes communications with programming terminals, internal diagnostics, etc.



These steps are continually processed in a loop.

Fundamentals of CAD

1. Introduction → write about CAD from page 1.

Fundamentals of CAD →

There are several fundamental reason for implementing a computer-aided design system:-

1. To increase the productivity of the designer.
2. To improve the quality of design.
3. To improve communications.
4. To create a data base for manufacturing.

1. To increase the productivity of the designer →

This is accomplished by helping the designer to visualize the product and its component subassemblies and parts and by reducing the time required in synthesizing, analyzing and documenting the design. This productivity improvement translates not only into lower design cost but also into shorter project completion times.

2. To improve the quality of design →

To improve the quality of the design, we use the CAD/CAM system. A CAD system permits a more thorough engineering analysis and a larger no. of design alternatives can be investigated. Design errors are also reduced through the greater accuracy provided by the system. These factors lead to a better design.

3. To improve communications →

Use of a CAD system provides better engineering drawings, more standardization



in the drawings, better documentation of the design, fewer drawing errors and greater legibility.

4. To create a database for manufacturing : →

(Collection of related data) In the process of creating the documentation for the product design (geometry and dimensions of the product and its components, material specifications for components, bill of material etc.) much of the required data base to manufacture the product is also created.

These are the main four fundamentals of the CAD. In these fundamental we can improve the productivity of the product, quality of the design of product, we can improve communication and to create a data base for manufacturing.

Design Process : →

Design process is the formulation of a plan to help an engineer build a product with a specific performance goal. A design process involves a no. of steps in a series. The main tasks of computer application in manufacturing systems are:

1. How computers are used in the generation and management of design information describing products?
2. How computers are used in the management of information about the manufacturing system, which makes the products?

The process of designing something is characterized as an interactive procedure, which consists of six identifiable steps or phases: →

1. Recognition of need.
2. Definition of problem.
3. Synthesis.
4. Analysis and optimization.
5. Evaluation.
6. Presentation.

(1) Recognition of need: →

This is the first step in the process design in the production of a product. We have a problem, to solve which we need the product. In it we should know about the problem that what is the problem to solve which we need that product. Hence in the production of a product, our first step will be the recognition of need. [What is the problem and what is its requirement]

(2) Definition of problem: →

After the recognition of need we defined the problem properly. That means we define and tell all over about the problem. Give the proper definition of the problem.

(3) Synthesis: →

After the proper definition of all about the problem, synthesis is the next step in the production of a product. In synthesis we design and produce the product.

④ Analysis and Optimization : →

After the step of synthesis we do the next step that is analysis and optimization. In this step we do analysis and optimization of the product produced in the synthesis step. We analyse and check that the product which we have developed is according to our requirements or not. upto which level it prove right and fulfill our requirement, to fill which we have developed this product.

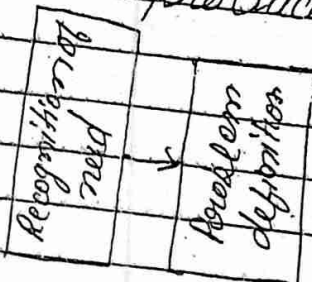
⑤ Evaluation : →

After the Analysis the product we get the result that upto which level the product fulfilled our requirements to solve the given problem. Take take evaluate this result and note it.

⑥ Presentation : →

After Evaluation step in it we present the product to the company and then to the customer.

We follow these all above 6-steps in producing a product or in designing the product.



Krishna Tewari

Krishna Tawara

Applications of computers in Design :-

CAD is an activity involves the effective use of computers to create, modify, analyze or document an engineering design. It is most commonly associated with the use of an interactive computer graphics system. This interactive computer graphics system is referred to as a CAD system. We use the CAD to get the following applications as:-

- ① Increased design productivity.
- ② Increased available geometric form in the design.
- ③ Improved quality of the design.
- ④ Improved design documentation.
- ⑤ Creation of a manufacturing database.
- ⑥ Design standardization.

① Increased design productivity :-

Use of computer in design increased design productivity. We use the CAD for it that is a graphics system.

② Increased available geometric form in the design :-

When we use the CAD computer graphics system, its use will increase the available geometric form in the design.

③ Improved quality of the design :-

The use of the computer in design will improve the quality of the design. Because we

facilitate many designing tools in computer.

④ Improved Design Documentation : →

When we use CAD computer graphics system, it will improve the Design Documentation.

⑤ Creation of manufacturing Database : →

When we do designing in computer system, we do the creation of manufacturing of the database of the designs.

⑥ Design Standardization : →

In manual designing we are unable to maintain the standard of the design. But when we use the computer for designing, we maintain the standard of the design.

We use the computers in design, if we fulfill the above applications.

Creating The Manufacturing Database : →

There are many application of use of computer in designing. Some of the application are creation of design document, increase productivity, improved design documentation, design standardization and etc. And creating the manufacturing database is also one of the most important components for getting the various benefits associated with computer applications. In this

CIM

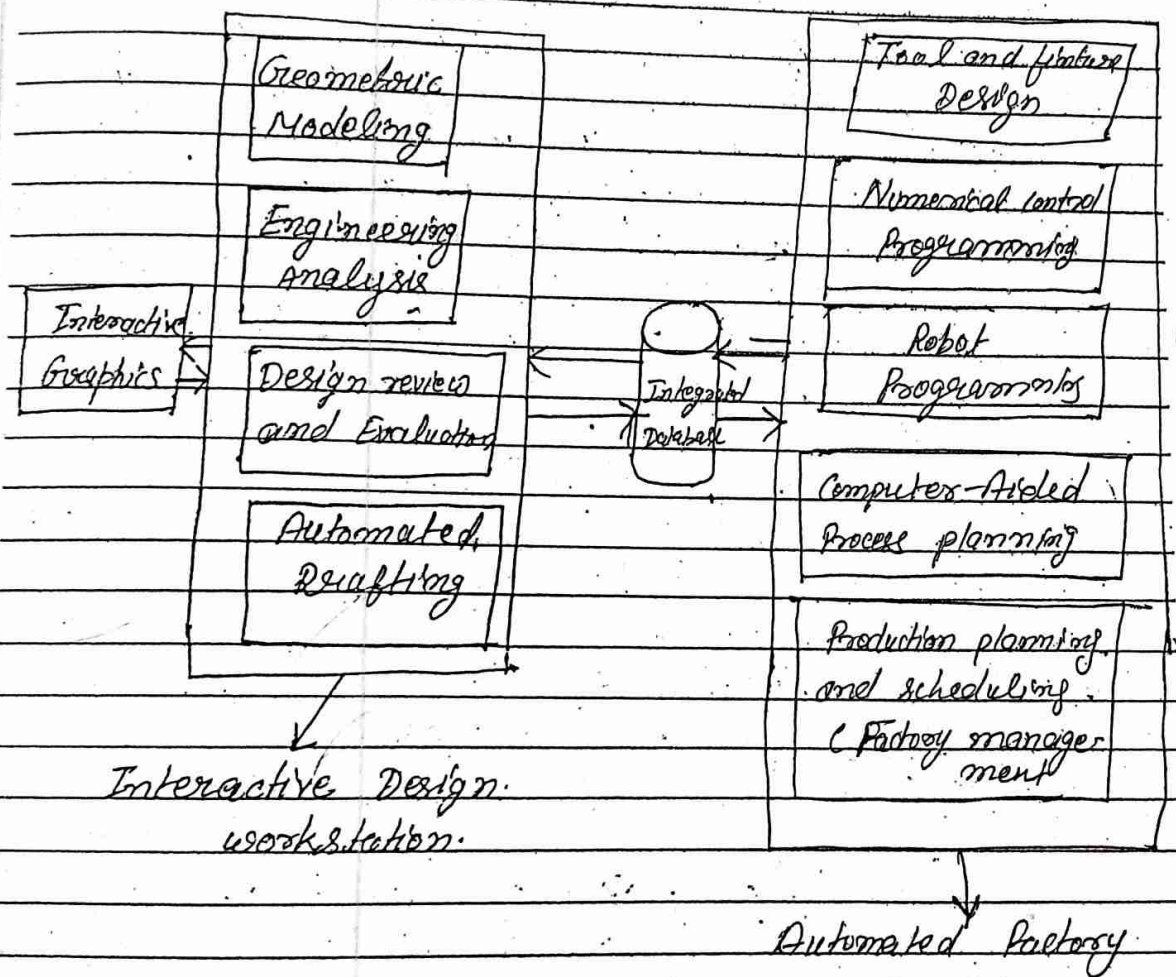
④

②

Computer Integrated manufacturing

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In this, the data is transferred from one function to other automatically. This leads to the concept of CIM. Creation of manufacturing database can be explained as follows: →

Creation of Manufacturing Database

In an integrated CAD/CAM system, a direct link is established between product design and manufacturing. The goal of CAD/CAM is not only to automate certain phase of design and manufacture but also to automate transmission from design to manufacturing. Most of the data

and documentation required to plan and manage the manufacturing operations for the product is created by the computer based system ^{mine}

The manufacturing database is an integrated CAD/CAM i.e. ERP database. It includes all the data on the product generated during design (geometry data, BOM and part lists, material specification etc.) as well as additional data required for manufacturing, much of which is based on the product design. The above figure shows how the CAD/CAM database is related to CAD and CAM in a typical production oriented firm.

Benefits of the CAD Software: →

CAD software is being used on large scale basis by a number of engineering professionals and firms for the various applications. Here are some of the benefits of implementing CAD systems in the companies: →

- 1) Increase the productivity of the designer.
- 2) Improve the quality of the design.
- 3) Better communication.
- 4) Creating documentation of the designing.
- 5) Creating the database for manufacturing.
- 6) Saving the design data and drawings.
- 7) Flexible software.
- 8) Flexible design.
- 9) Easy design projection.
- 10) Time efficiency.
- 11) Cost effective.

1/4/2020

1) Increase in the productivity of the designer:--The CAD software helps designer in visualizing the final product that is to be made, its subassemblies and the constituent parts. The product can also be given animation and see how the actual product will work. Thus helping the designer to immediately make the modifications if required. CAD software helps designer in synthesizing, analyzing, and documenting the design. All these factors help in improving the productivity of the designer.

2) Improve the quality of the design:--The CAD software offered large number of tools that help in carrying out the proposed design. The tools also help designers to consider large number of investigations. The CAD systems offer greater accuracy. The errors are reduced drastically in the designed product leading to better design. Thus it improves the quality of the design.

3) Better communications: The next important part after designing is making the drawings. With CAD software better and standardized drawings can be made easily. The CAD software helps in better documentation of the design.

4) Creating documentation of the designing: Creating the documentation of designing is one of the most important parts of designing and this can be made by the CAD software. The documentation of designing includes geometries and dimensions of the product, its subassemblies and its components, material specifications for the components, bill of materials for the components etc.

5) Creating the database for manufacturing: When creating the data for the documentation of the designing most of the data for manufacturing is also created like products and component drawings, material required for the components, their dimensions, shape etc.

6) Saving of design data and drawings:--All the data used for designing can easily be saved and used for the future reference, thus certain components don't have to be designed again and again. Similarly, the drawings can also be saved and any number of copies can be printed whenever required.

7) Flexible Software:--CAD/CAM equips every designer to change a software programme in the fastest way possible. CAD/CAM can easily be modified to conform to the new design.

8) Flexible Design:--We can create Design according with our requirement. We have flexible designs in CAD

9) Time-efficiency:--CAD/CAM functions faster than any other design software or method. Designers can easily create design without spending too much time in the drawing board. The designer can save time in modifying a part of the design rather than throwing away entire the design altogether and coming up with a new one.

10) Cost-effectiveness:--When all the benefits are combined and directly reaped by the designer, the manufacturing process will truly be cost-effective.

These are just some of the benefits of CAD/CAM.

Hardware of CAD System:

A CAD system should contain the following hardware:-

- ① Main frame computer and graphics terminal.
- ② Turn key CAD system
- ③ Work stations and high-end personal computers.

① Main frame computer and graphics terminal:

The main frame computer and graphics terminal should be powerful for doing their job properly. They should be in convenient in nature. And the cost of these hardwares is very high.

② Turn key CAD System:

Dedicated computer systems for CAD applications, consisting of a super mini computer and several design workstations. These system follows central control concept. But these systems are inconvenient and not powerful enough, for complex 3D modeling.

③ Work station and high end personal computers

These computers support multiple task. It also support network and file saving sharing. So these are convenient systems. These systems are of low cost. These are in present trend.

Minimum Hardware requirement for a CAD system is as follows:

- ① Processor: Pentium Core 2/i3
- ② Graphics card: NVIDIA with minimum 1GB
- ③ RAM: 4 GB
- ④ Hard drive: minimum of 30 GB free space for

~~Palette~~

palette CAD

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⑤ Display: minimum 1280 x 900 pixels.

⑥ Drives: DVD

⑦ USB ports: 2.0 or higher

⑧ Operating system: Windows 7, 8 or 10.

INTRODUCTION

NOTES

Computer graphics refers to the creation, storage and manipulation of pictures and drawings using a digital computer. With developments in computing technology interactive computer graphics has become an effective tool for the presentation of information in such diverse fields as science, engineering, medicine, business, industry, government, art, entertainment, advertising, education, and training. There is virtually no field in which graphical displays cannot be used to some advantage and that is the basic reason why application of computer graphics is so widespread.

It is a fact that one picture is worth a thousand words. Therefore, interfaces empowered with graphics enhances the communication between the computer and its users. Representation of a huge set of numbers in the form of a graph or a picture helps in a better understanding and interpretation of the characteristics or pattern of the data contained in the set of numbers. Graphic displays also improve understanding of complex systems, and visualization of two-dimensional (2D), three-dimensional (3D) objects.

A major application of computer graphics is designing, particularly engineering and architectural systems. Almost all consumer products are now computer-designed. Computer-aided design (CAD) techniques are now routinely used in the design of building, automobile, aircraft, watercraft, spacecraft, defense mechanism, computer-component, industrial machinery and device, textile and increasing number of other products ranging from a pen to a refrigerator. In a computer-aided design environment, traditional tools of design are replaced by parameterized modeling routines with interactive graphic capabilities that are so active and dynamic that the designer can carry out unlimited number of experiments involving complex computation in search for better design. Powerful digital graphic tools for molecular modeling have added a new dimension in the research of emerging fields like Biotechnology and Bioinformatics.

Among the other applications of computer graphics, Image Processing, Animation, Morphing, Simulation, e-Learning Material Designing and Graphic Designing are rapidly gaining demand and usage in education, training, advertisement and entertainment. Computer graphics has highly influenced the film industry with its multimedia applications. Controlled animation, simulation and morphing have increasingly been applied in the study of time-varying physical phenomena, object movement and operating sequences of machinery in scientific and industrial research. Computer-aided image processing and picture analysis are now indispensable tools for remote sensing, aerial survey, space research, pattern recognition, CT scans and research in medical science.)

Image Scanner :— It is a device that produces a digital image of a document for input and storage in a computer. It uses technology similar to that of a photocopier. It works on the principle of digitizing an image in the form of bit-matrix called bit-map. It is used to store image like photographs, for easy and quick retrieval. Small scanner can be passed over the document surface by hand. Larger scanner have a flat bed, like a photocopier, on which the input document is passed and scanned.

Thus flatbed and hand-held scanners are most commonly used & very popular scanners. It is possible to store both text and images. If text is input with a scanner, the image captured is seen by the computer as a single digital picture rather than as separate characters.

Scanner can be classified on the basis of following:

- ★ Bit depth. ✓
- ★ Resolution. ✓
- ★ Size and Shape. ✓

Scanner are widely used to input graphics for use in desktop publishing.

UNIT-2

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Design Work-station

known as CAD work station. A CAD work station is the system interface with the outside world. It represent significant factor which determine how Convenient efficient is the system for designing. A general Computer system is not considered as work station because of it takes graphics terminal and special input devices like electronic tablet and pen. It is an intermediate system or interface b/w CAD design and outside world.

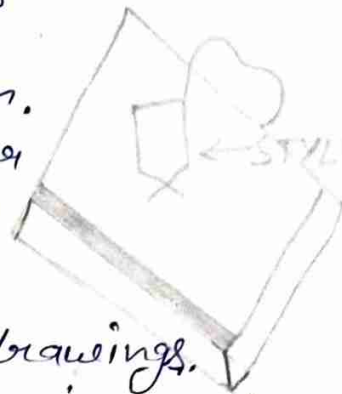
A Major Component of work-station are : -

- (1) Graphics Terminal.
- (2) Operator input devices.

② (1) Graphics Terminal : -

A graphics terminal is an electronic or electro-mechanical hardware device. It is used for entering data into, and displaying data from a Computer or a Computing system. The terminal that were use before this were inexpensive devices but very slow. As Compared to punched Card or paper tape for input. But as the technology get improved and video displays were introduced, terminals pushed these older form of interaction from the industry. After that time sharing system were developed evolved in parallel. These system were able to support multiple users on the same machine, each at there own terminal. The function of a terminal is confined to display

Graphics tablet :- A digitizer or graphics tablet is a device that converts an analogue video signal into a digital format so that video images can be input, stored, displayed and manipulated by a computer. It is a flat surface over which a stylus is moved. It uses an electrical sensing mechanism to measure the stylus position. In one such arrangement, hundreds of copper wires in the form of grid are connected to the computer. Each copper wire receives electronic pulses. A stylus which is sensitive to these pulses sends signals to the computer to form drawings.



Digitizers are used by architects and engineers in Computer Aided Designing for designing purposes such as building cars, mechanical parts, robots etc.

The graphics tablet is generally used to input two-dimensional coordinates. They are also used in Geographical Information System for digitizing of maps.

Advantage

- ① It takes less computer time than the other input device eg. light pen.
- ② The drawings displayed on the screen are more precise than on paper.
- ③ The effects of the drawing can quickly be analyzed, easily be changed, thus saving a lot of time.

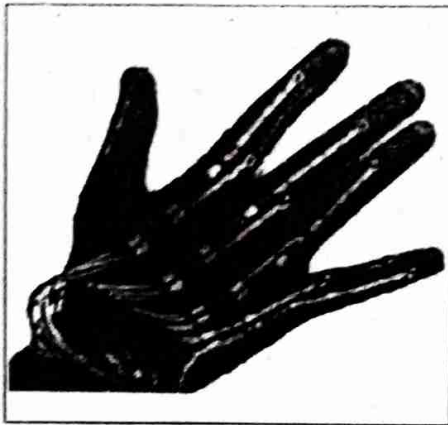


Figure 1.8: Data Glove

1.2.9 Voice-System

The voice-system or speech recognition system is a sophisticated input device that accepts voice or speech input from the user and transforms it into digital data that can be used to trigger graphic operations or enter data in specific fields. A dictionary is established for a particular operator (voice) by recording the frequency-patterns of the voice commands (words spoken) and corresponding functions to be performed. Later when a voice command is given by the same operator, the system searches for a frequency-pattern match in the dictionary and if found the corresponding action is triggered. If a different operator is to use the system then the dictionary has to be re-established with the new operator's voice patterns.

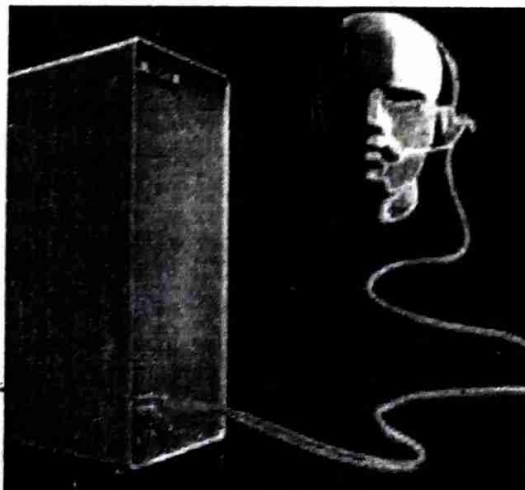


Figure 1.9: Operator's Speech Recording

1.3 SUMMARY

This unit introduces the forms and functions of input devices which are used as computer peripherals based on the requirement of specific computer graphics applications. An application program can make simultaneous use of several input devices operating in different modes. For example, a keyboard, a mouse, a scanner and a voice system can all be attached to the same computer interacting through the same or different graphical user interfaces. Many input devices are multifunctional and so more than one device can provide the same class of input data. Still the popularity of input devices varies based on the functional capabilities and users convenience. Continuous devices like tablets, joysticks and mouse

NOTES



Introduction Software Configuration of a Graphics System : →

Computer Graphics s/w and Database : →

The CAD h/w is useless without the s/w to support it. The graphics s/w is the collection of the program written to make it convenient for the user to operate the Computer Graphics System. It includes the program to generate image on CRT screen, to manipulate the image and to accomplish various type of interactions b/w the user and system.

In addition to the graphics s/w there image bi additional program for implementing certain specialized functions related to CAD. These include design analysis program and manufacturing planning programs. The graphic s/w for a particular computer system must be according to the type of h/w used in the system. The s/w must be written specially for the type of CRT and type of input devices used in the system. The detail of the s/w for a stroke writing CRT would be different than for a raster scan CRT. The difference is b/w a storage tube and refresh tube would also the graphics s/w. All though there may be trouble to the user up to some extent.

They are important consideration in the design of an interactive computer graphics system. List of some ground rules that should be consider in designing graphics s/w : —

① Simplicity : → The graphics s/w should be easy to use.

u

2. Consistency: → The package should operate in a consistence and predictable way to user.

3. Completeness: →

There should be no inconvenient in the set of graphics function.

~~error free~~ Robustness: → The graphics system should be used error free performance.

5. Performance: → With in limited use of h/w by the system should be as much as possible and should be efficient. And the speed of response should be fast and consistence.

6. Economy: → Graphics program s/w should not be more expensive.

Software Configuration of a Graphics System: →

In the operation of the graphics system by the user a variety of activity take place which can be divided into 3 categories.

1. Interact with graphics terminal to create and ^{change} alter image on the screen.

2. Construct a model of something physical out of the image on the screen. The model are some-time called application model.

3. Enter the model into computer memory as a secondary storage.

In working with graphics system. The user perform these various activities in combination rather than sequentially. The user construct a physical model

Application Program : → is used in graphics package

The central module is the application program. It centralises the storage of data into and retrieve data out of the application database. The application program is ^{apply} driven by the user through the graphics package which is also known as the graphics system. The application program is implemented by the user to construct the model of physical entity whose image is to be view on the graphics screen. The application program are written for particular program areas. Problem area in engineering design would include architecture construction, mechanical component and aerospace engineering. Problem area other than design would include graphical display of data, mathematical analysis and even art work.

Graphics Package : →

The graphics package is the software support b/w the user and graphics terminal. It manage the graphical interaction b/w the user and the system. It also serve as the interface b/w the user and application s/w. The graphics package consist of input subroutine and output subroutine. The input routine accept input command and data from the user and forward them to application program.

Interactive computer graphics.

Application Database : → The third module in the TCG

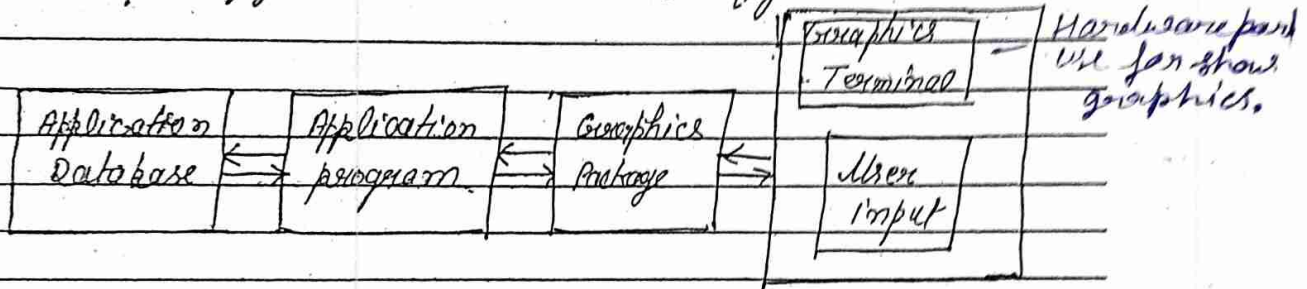
s/w is the database. The database content mathematical, numerical and logical definition of the application module such as electronic circuit, mechanical component, automobile body and so on.

and input it to memory interactively, describing image on the screen. The reason for separating these activities in this method is that they correspond to the general configuration of the s/w package used with the interactive computer graphics system.

The graphics software can be divided into 3 modules according to a conceptual model suggested by 'Foley' and 'VAN-DAM'.

1. The graphics package also called graphics system.
2. The application program.
3. The application database.

The s/w configuration is shown in figure below: →



Model of graphics s/w Configuration.

The central module is the Application Program. It control the storage of data into and retrieve data out of the application database.

The module parts of the Computer Graphics Software are as follows: →

- ① Application Database
- ② Application program
- ③ Graphics package
- ④ Graphics Terminal
- ⑤ User input

1. Generation of Graphics Element : →

A graphics element in computer graphics as a basic image may be such as dot (or point), line, segment, circles and so on.

The collection of element in the system could also include alpha-numeric, characters and special symbols. This speed up the process of generated the element. The user can construct the application model out of a collection of element available in the system. The term primitive is often used in reference to graphics element according a primitive is a 3-dimensional graphics element such as sphere, cube, cylinder. In 3-dimensions a wire frame model and solid modeling point base is used as a building block to construct the 3-D model of the particular object of interest to the user.

2. Transformation : →

Transformation are used to change the image on the display screen and to reposition the item in the database.

Transformation are applied to the graphics element in order to aid the user in constructing an ^{which have meaning} applicable model. These transformations include reduction of the image by a process called scaling, reposition the image or translation and rotation. ^{process of increase and decrease size of image} scaling is a

3. Display Control and Windowing Function : →

This function set provide the user with the ability to view

It also includes alpha, numerical information associate with the model such as bill of material, mass property and other data content of the database can be readily as cut as plotted out in hard copy form.

Function of the Graphics Package :-

The function of the graphics package sp/w for a CAD system is to provide graphics capabilities so that the various applications can make use of them to help solved design problem as a result of its objectives. The graphics system sp/w has to be written and organise into a structure that is sufficient to meet the requirement of many different and diverse applications of CAD. A graphics package should essentially provide a system for handling user actions a set of basic graphics function and utilities and a system for the operation of application program.

It is important that a graphics package be design in such a manner as to allow application system to be incorporated into the CAD system without the application program.

The graphics package must perform a variety of different function. These function can be group into function set. Each set accomplish complete menu a certain kind of interaction b/w the user and the system.

Some of common function sets are :-

1. Generation of graphics element.
2. Transformation.
3. Display control and windowing function.
4. Segmenting function.
5. User Input function.

course be written specially for the particular component of input device.

The input functions should be written to maximize the benefit of interactive features of ICD. One of the goals that were sought after by the s/w. designer in computer graphics is to simplify the user interface so that a designer with little or no programming experiences can function efficiently on the system.

Syllabus

Constructing the geometry : → * - *

This Syllabus in

1.) The use of a Graphics Element : →

In constructing the geometry we use some ~~graph~~ ^{graphics} elements like dot. These element are known as graphics elements. These elements are called by the user during the constructing process and add one by one to create the model. There are several aspects about this construction process which will be discuss :-

1. First as new element is being called but before it is added to the model, The user can specify its size, its position and its orientation. These specifications are necessary to perform the model to the proper shape and scale. For this purpose the various transformations are utilize
2. The second features available during model building is the capabilities to group.

The image from the ^{desired} angle. This is something refer to as windowing because graphics screen is like a window being used observe the graphical model. Another aspect of display control is hidden line remove. In most graphics system the image is made up of lines used to represent a particular object. In some system the user must identify which lines are invisible so that they can be remove from the image to make it more understandable. In another system the graphics package is sufficiently sophisticated. The remove the hidden line from picture automatically.

4. Segmenting function : →

Segmenting function provide the users with the capabilities to select, replace, delete or otherwise modify portion of the image. The term segment refer to a particular portion of the image which has been identified for purpose of modify it.

Storage tube, CRT tube are unsuited to segmenting functions to delete or modify a portion of the image on a storage tube. require erasing the entire pictures and drawing it.

5. User Input Function : →

User input function constitute a critical set of functions for a graphics package because they permit the operator to enter the command and data to the system. The user input function must be

CAD Data Exchange : → 50 III

(CADI) 21

Cad data exchange is a modality of data exchange used to translate data between different Computer aided designs. This exchange is between two cad systems or two authoring systems or two customer

Transfer of data between organisation is necessary.

It is necessary because if a model is developed by one organisation and the another organisation

can do analysis work on it (same model). And ~~the~~ at the same time the third organisation is

responsible for manufacturing the product. The CAD systems currently available in the market differ not only in their applications, aims, user interfaces, and performance levels. But also in data structures and data formats. Therefore there should be accuracy

• In data exchange process, it is very important, for data exchange the robust exchange mechanisms are needed.

The first target for the exchange of data is the geometric information of the CAD data. It can also target other aspects such as metadata, knowledge, manufacturing information, tolerance and assembly

structure. There are three methods of translation of data b/w different organization. These methods are as follows:-

Methods of Translation: →

CAD 2

- ① Direct CAD system export/import.
- ② Direct 3rd party translators.
- ③ Intermediate data exchange formats.

① Direct CAD System export/import: → This method of translation is also known as internal Direct method for translation of CAD data. In this method the CAD system can directly read and/or write other CAD formats. It is done simply by using file open and save as options. As most CAD file formats are not open, this option is limited to either systems owned by the same company or via hacking of competitor's file formats.

② Direct 3rd party Translators: → This method of translation of CAD data exchange is also known as direct external data exchange method. In this method the information is read at one system and write at another system. CAD system formats. There are a number of parties through which the data get pass through and after passing a no. of CAD system, it reaches to the last and target CAD system.

③ Intermediate Data exchange formats: — This method of translation is also known as levels of data exchange of formats. In this method the data format is generated

Role of multimedia in CAD

As we know multimedia is a collection of ~~is~~ text, image, audio and video. The information can be convey properly with the help of multimedia. Multimedia is very important for communication it play and important role in various fields like business, education, training, hospitals etc. In the same manner multimedia play and important role in cad also. Multimedia is important in cad for engineering design training. CAD has increasing role in the research development, production of product and complex tools for industry such tools are demands for designing that specify customer requirement. Multimedia technology is used to develop improvements in training of engineering design. Multimedia is also useful in redesign operations. Engineering design specialist trained through the application of multimedia technology

Diff. OLAP and OLTP!!

	OLAP	OLTP
Purpose	To help with planning, problem solving and decision support.	To control a more fundamental business task.
Speed	It is slow	It is very fast.
Market	It is customer oriented	It is market oriented
User	It has few concurrent user.	It has many concurrent user.

OLAP => Online Analytical processing

OLTP = Online Transactional processing.

Building Data Warehouse → UNIT-4

house consists of the following steps :

- ① Extracting Transactional Data .
- ② Transforming the transactional Data .
- ③ Creating a Dimensional Data .
- ④ Loading the Data .
- ⑤ Generating Pre-calculated Summary Values .
- ⑥ Building or Purchasing a Front end Reporting Tool .

① Extracting Transactional Data : → A large part of building a datawarehouse is pulling data from various data sources and placing it in a central storage . Actually this is most difficult step to accomplish . Because it is much difficult to pull data from various data sources . That's why most of the people who worked on the system in place have moved on to other jobs . The people who works on data warehouses have to know what in which database they are working on and how they can extract data from the database sources . Even though now a days we have microsoft with an excellent tool for data extraction . It is useful for many small size companies .

② Transforming Transactional Data : → This step is equally important and challenging step after the first step of extracting data from different

data source. In this step we do relate the data extracted from the different sources. Because we extract data from the different sources or multiple sources that are built by different IT professionals, so these data will be quite different from each other. So to relate these data extract from different sources is quite difficult. The reason for this is that every person in this universe looks by its own eyes that is quite different. When we building a datawarehouse, we need to relate data from all of these sources and build some type of a staging area that can handle data extracted from any of these source systems. After all the data is in the staging area, we need have the message it and give it a common shape. Before to massaging data, you need to figure out a way to relate tables and columns of one system to the tables and columns coming from the other system.

③ Creating a Dimensional Model → The third step in ~~creating~~ building a datawarehouse is creating a dimensional model. Most modern transactional systems are built using the ~~trans~~ relational model. The relational model is highly normalized when designing such a system. In it we try to rid of repeating columns and make all columns dependent on the primary key of each table.

and over 9 users have microsoft reporting for office 2000 on their desktops, The pivot Table service of Microsoft Excel 2000 will do the job. If the reporting needs are more than what excel can offer, we will have to investigate the alternative of building or purchasing a reporting tool. ~~The~~ The Building or purchasing a front-End Reporting Tool depends upon the user need and requirements.

⇒ Extraction in Data Warehouse ⇒ Extraction is the operation of extracting data from a source system for further use in a data warehouse environment. This is the first step of the ETL process. After the extraction, this data can be transformed and loaded into the data warehouse. This data is ~~trans~~ extracted from the source system. The source system for a data warehouse are typically transaction processing application means that the data that is extracted from source is transformed further in the next-to-next step. For example one of the source system for a sales analysis data warehouse might be an order entry system that records all of the current order activities. Designing & creating the extraction process is often one of the most

④ Loading The Data: → After the ⁵⁹creation of the dimensional model, it's time to populate it with the data in the staging database. This step is very effective in it. It might involve combining several columns together or splitting one field into several columns. We might have to perform several lookups before calculating certain values for your dimensional model. Data transformations can be performed at two stages: —

- ① while extracting the data from their origins or
- ② while loading data into the dimensional model

⑤ Generating precalculating, summary values: → The next step after loading the data into dimension is generating the precalculating summary values. This process is commonly known as aggregations. This step has been simplified by SQL server, Analysis server. The aggregation process takes more time to complete. Before aggregation we have to choose an appropriate dimension model. It takes more space then to aggregate the dimensions. A no. of dimensions can be aggregated. For doing aggregation we have to make some additional tables also.

⑥ Building or Purchasing a Front end Reporting Tool: —

After you have build dimensional database and populated it with data or loading the data in the dimensional and then doing aggregations we can decide that how our reporting tool need to be.

Time consuming tasks in the ETL process. (5)

The source systems might be very complex and poorly documented and thus to determine that which data needs to be extracted can be difficult. The data has to be extracted normally not only once but several times in a periodic manner. It is done periodically to supply all changed data to the datawarehouse and keep it up-to-date.

Designing this process means making decisions about the following two main aspects: -

① Which extraction method do I choose?

② How do I provide the extracted data for further processing?

Extraction Methods for Data Warehouses: →

① Logical Extraction Methods: -

There are two kinds of logical extraction.

* Full Extraction.

* Incremental Extraction.

② Full Extraction : → The data is extracted completely from the source system. Since this extraction reflects all the data currently available on the source system.

There is no need to keep track of changes to the data source since the last successful extraction. The source data will be provided as is and no additional logical information is necessary on the source side.

Incremental Extraction : - At a specific point in time, only the data that has changed since a well defined event back in history will be extracted. This event may be the last time of

interaction on a more complex business event like the last booking day of a fiscal period. To identify this delta (slightly) change there must be a possibility to identify all the changed information since this specific time event. This information can be either provided by the source data itself like an application.

(2) Physical Extraction Method : → Depending on the chosen logical extraction method and the capabilities and restrictions on the source side, the extracted data can be physically extracted by two mechanisms.

- * Online Extraction

- * Offline Extraction.

- * Online Extraction : - The data is extracted directly from the source system itself. The extraction process can connect directly to the source system to access the source tables themselves or to an intermediate system that stores the data in a preconfigured manner.

- * Offline Extraction : → The data is not extracted directly from the source system but is staged explicitly outside the original source system. The data already has an existing structure or was created by an extraction routine. You should consider the following structures

- * Flat files

- * Data in a defined, generic format

- * Dump files

- * Redo and archive logs

- * Transportable tablespaces

62 (1)

Data Transformation : → Data Transformation is set of technical and business rules that have been extracted from the source system and software. Some intelligent projects present the best opportunities to remove dead and useless data to bring new light to business people information requirements. Data transformation activities should be properly implemented to produce clear, condensed, new, complete and standardized data respectively.

Area that are covered by Data transformation includes—

① Cleaning : → It is done by definite transformation process in which data that violates business rules is changed to conform these rules. It is usually done by ETL programs.

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Source data transformation could be an endless process and so the time required for the data transformation is undeterminable (that cannot be estimated). The rules for the data transformation should not be limited strictly. For the standardization, 80% rules should be business data domain rules and 20% rules should be technical rule of conversion.

Data Transformation involves two phases:

(1) Data Mapping:— The assignment of elements from the source base or system towards the destination to capture all transformations that occur. This is made more complicated when there are complex transformations like many-to-many, one-to-one or one-to-many. rules for transformation.

2) Apply commonly used transformational languages:

* Perl

* AWK

* XSLT

* TXL

* Template language.

These are language which are used for data transformation standard which is mapped from source to destination

64
Data cleaning for Data Warehousing: → It is a process to determine inaccurate, incomplete or unreasonable data and then improving the quality through correction of detected errors and omissions. This process of cleaning for Data Warehousing includes.

- format checks.
- completeness checks.
- reasonableness checks.
- limit checks.
- review of the data.
- assessment of data by subject area experts.

The above processes produce the results in the form of correction and subsequent ^{Continuously} checking of records.

There are a number of terms used by different researchers to refer largely to the same process. This is a process which also may include

- Error checking: (answer found in Yes or No)
- Error Detection (error check error)
- Data Validation
- Data Scrubbing (collected data and dust free errorless data or format error)
- Data Correction (wrong form to correct form & data and change error)

Data cleansing is especially required when integration of heterogeneous data sources and ~~should be~~ ^{are} addressed together.

Data Cleansing is useful to get the following features.

- ① Data Quality.
- ② Accuracy in Data.
- ③ Integrity of data. (Sanity form)

(4) Completeness of Data.

(5) Validity of Data.

(6) Consistency of Data (when we perform operation on data, the meaning or form of data not changes)

(7) Schema Conformance.

(8) ~~Schema~~ Conformance Uniformity.

(9) Density ratio (small area to large data arrange them)

(10) Uniqueness. (not duplicacy)

→ Data quality means error free mechanism in data warehouse. The quality of data needs to be improved by using the data cleaning techniques. Existing data cleaning techniques used to identify record duplicates, missing values, records. These cleaning improve the quality of data.

→ Accuracy: Accuracy is described as an aggregated value of the data. The data should be accurate over criteria integrity, consistency and density.

→ Integrity defines how the data records are merged to give a formal look. After the integration the data should be consistence and also should be complete. An integral data collection contains representation of all the entities in the mind-word (single entity). There should not be invalid or missing tuples after integration of data.

→ Completeness: After the cleaning of data, the data that we get will be complete. Means we will get completeness of data after cleaning remove the unused data.

→ Validity means that we get ⁽¹¹⁾valid data after the cleansing. Because we do after the cleansing of data we get the quality data, consistence, valid and complete data. so we can say the validity feature is obtained after the cleansing the data.

→ Consistency: - It deals with the ^{problem} anomalies as well as contradictions. In cleansing we will get anomalies and contradictions. poor data in the system.

→ Schema Conformance: - It is deals with the consistency of the data. After the cleansing we get the schema conformation. Schema explain the structure of the database in which the data will be stored. The no. of rows and the no. of ^{columns} tuples are explained or conformed by it.

→ Uniformity: - It is directly related to irregularities. i.e. the proper use of values within each attribute. Uniformity deals with those attributes not containing irregularities in their values.

→ Density: - It is quotient (amount) of missing values in the tuples of a relation. There still can be values or properties non-existent that have to be represented by null values having the exact meaning of not being known.

(full record of a data)

diff. from all
→ Uniqueness: → It is the quotient of tuples representing the same entity in the real world and the total no. of tuples in relation R . A collection that is unique does not contain duplicates. Any tuple should not contain any anomalies (problems)

Some Problems that we face for the Data Cleaning: -

- (1) Single source problem → Problems when source is single.
- (2) Multi source problem → Problems when source is not single.

Imp Data Warehouse Architecture: → Data warehouse is an environment, not a product. This is based on relational database management system that functions as the central repository for information data. The central repository information is surrounded by number of key component designed to make the environment is functional, manageable and accessible. The data source for data warehouse is coming from operational applications. The data entered into data warehouse is transformed into an integrated structure and format. The transformation process involves conversion, summarization, filtering and condensation. The data warehouse must be capable of holding and managing large volume of data as well as different structures of data structures.

Components of Data Warehouse: - There are seven components of data warehouse: -

1. Data sourcing, cleanup, transformation & migrate
2. Metadata repository - data about data tools.
3. Warehouse / data technology.
based on any technology on data

4) Data marts (1) ~ (Relational database management systems) (RDBMS) (13)

5) Data query, reporting, analysis and mining tools

6) Data warehouse administration and management

7) Information delivery system.

① Data Warehouse Database : → This is the central part of the data warehousing environment. This is the (item number 2) in the architecture of the datawarehouse. This is implemented based on RDBMS technology.

② Sourcing Acquisition, Cleanup and Transformation Tool ^{data} _{database}

This is the item number 1 in the above architecture of Datawarehouse. They perform conversions, summarization, key changes, structural changes and condensation. The data transformation is required so that the information can be used by decision support tools. The functionalities of these tools are as follows: -

→ To remove unwanted data from operational database

→ Calculating summaries and derived data.

③ Meta Data → It is the data about data. It is used for maintaining, managing and using the datawarehouse. It is classified :-

* Technical data : → It contains information about data warehouse data used by warehouse designer.
 what range it what form

* Business Meta Data : → It contains information stored in datawarehouse

(14)
(1) Access tools : → Its purpose is to provide information to business users for decision making. There are five categories.

→ ^{Operational performance} Data query and report tools.

→ Application development tool.

~~Executive~~ Executive info. system tool (EIS)

→ OLAP tools.

→ Data mining tool.

(2) Data Marts : → Data mart is used in the following situation: -

→ Extremely urgent user requirement.

→ The absence of a budget for a full amount of data of a warehouse.

→ The decentralization of business needs.

→ For doing easy use of tools.

(3) Data warehouse admin. and management : →

The management of data warehouse includes: -

* Security and perlocity management

* Monitoring updates from multiple sources.

* Data quality checks

* Managing and updating meta data.

* Auditing and reporting data.

* Backup and recovery.

Archiving data

* Data warehouse storage management.

⑦ Information delivery system : →

- * It is used to enable the process of subscribing for data warehouse information.
- * Delivery to one or more destinations according to specified scheduling algorithm. *step by step solve any problem*

⑧ Mapping the Data Warehouse Architecture

to multiprocessor Architecture : → *more than one users on work* The function

of datawarehouse are based on the relational data base technology. The relational database technology is implemented in parallel manner. There are two advantages of having parallel relational database technology for datawarehouse : —

Linear speedup : → means the ability to increase the no. of processors to reduce response time

Linear scale up : → means the ability to provide same performance on the same requests as the database size increases.

Types of Parallelism : → There are ~~four~~ ^{two} types of

① Inter query Parallelism : — This form of parallelism decomposes the serial SQL query into lower level operations such as scan, join, sort etc.

- (16)
- ② Intra query parallelism: → This type of parallelism can be done in two ways: -
- Horizontal parallelism: - This means that, the database is partitioned across multiple disks and parallel processing occurs within a specific task.
- Vertical parallelism: → This occurs among different tasks. The data and the tasks that are mapped are partitioned into different partitions as follows: -

① Data Partitioning: - Data partitioning is the key component for effective parallel execution of database operations. Partitions can be done randomly or intelligently.

② Random Partitioning: - Random partitioning include random data striping across multiple disks on a single server. Another option for random partitioning is round robin fashion. In other words, an output from one task become an input into another task.

③ Intelligent partitioning: - It assumes that DBMS knows where a specific record is located and does not waste time searching for it across all disks.

④ Hash Partitioning: - A hash algorithm is used to calculate the partition number based on the value of the partitioning key for each row.

⑤ Key range partitioning: → Rows are placed and located in the partitions according to the value of the partitioning key. That is all the rows with the key value from A to K are in partition 1; L to T are in partition 2 and so on.

DBMS Schemas ^{is a physical structure} for decision support. (17) - 72
→ The basic concept of dimensional modeling are: facts; dimensions and measure. A fact is a collection of related data items, consisting of measures and context data. It typically represents business items or business transactions. A dimension is a collection of data that describe one business dimension. Dimensions determine the contextual background for the facts; they are the parameters over which we want to perform OLAP. In Relational Content, there are three basic schemas that are used in dimensional modeling:

- ① Star Schema
- ② Snowflake Schema
- ③ Fact Constellation Schema

① Star Schema → The multidimensional view of data is expressed using relational database ^{rules} semantics. These semantics are provided by the database schema design called star schema. The basic of star schema is that information can be classified into two groups:

- * Facts
- * Dimension

Star schema has one large central table, called the fact table.

And the set of smaller tables is called dimensions. These dimensions are arranged in a radial pattern around the central table.

Dimensions very , snowflake schema (15) ✓
Facts are core data element being analyzed while dimensions are attributes about the facts.
The star schema architecture is the simplest data warehouse schema. It is called a star schema because the diagram resembles a star. It has points radiating from a center. The center of the star consists of fact table and the points of the star are the dimension tables. Usually the fact tables in a star schema are in 3rd normal form (3NF) whereas dimensional tables are denormalized.
Despite the fact that the star schema is the simplest architecture, it is the most commonly used nowadays and is recommended by Oracle.
The main characteristics of star schema: -

- Simple structure
- easy to understand the schema
- great query effectiveness.
- small no. of tables to join
- Loading data into dimensions is easy.
- the most commonly used in the data warehouse implementations.

② Snowflake Schema: → This schema is the result of decomposing one or more of the dimensions. The many-to-one relationship among sets of attributes of a dimension can separate new dimension tables forming a hierarchy. The decomposed snowflake

Dimensions very well. 74 (11) ✓

Characteristics of Snowflake schema:-

- easy to use
- easy to implement
- Small module which are easy to construct
- All the data are related with each other.
- Structure is very simple.

③ Fact Constellation : → For each star schema it is possible

to construct fact constellation schema. For example, by splitting the original star schema into more star schemas each of them describes facts on another level of dimension hierarchies. The fact constellation architecture contains multiple fact tables that share many dimension tables.

The main advantage of fact constellation schema is a more complicated design because many variants for particular kinds of aggregation must be considered and selected. Moreover, dimension tables are still large.

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77

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(commonly used transformational languages :-)

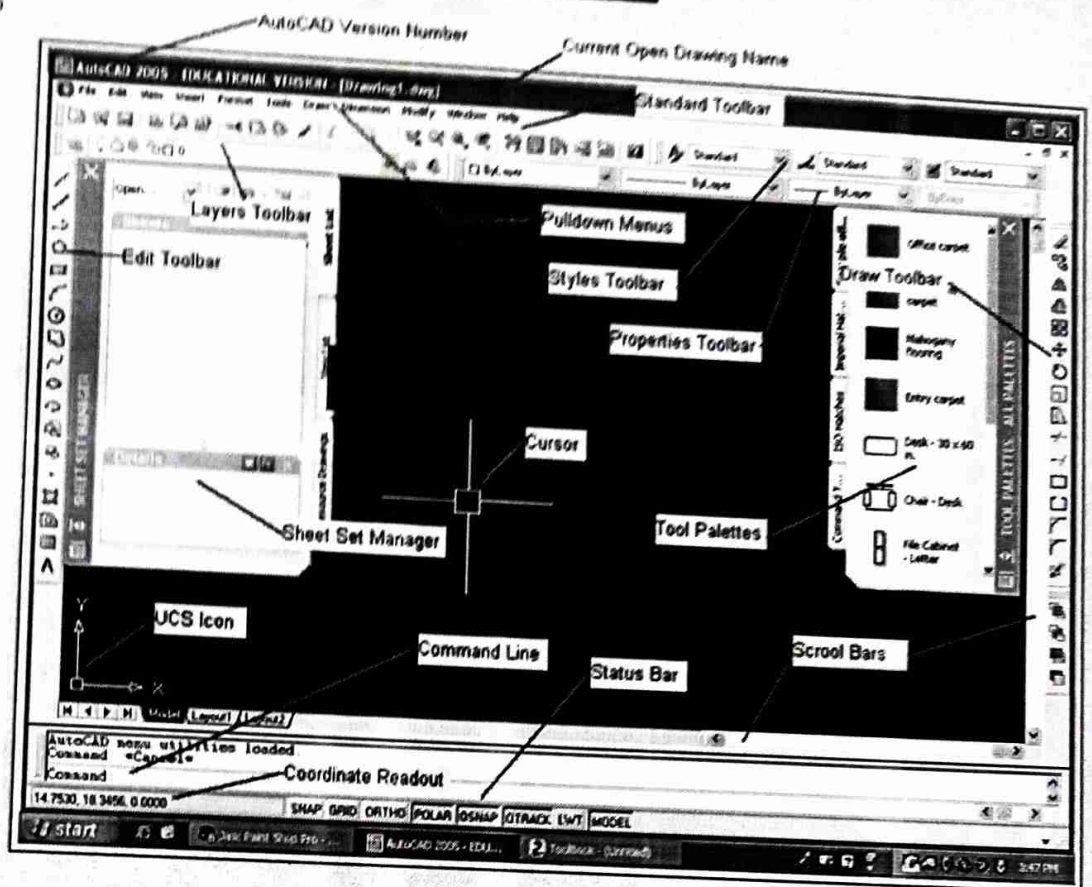
- * Perl
- * AWK
- * XSLT
- * TXL
- * Template language.

AutoCAD Basics

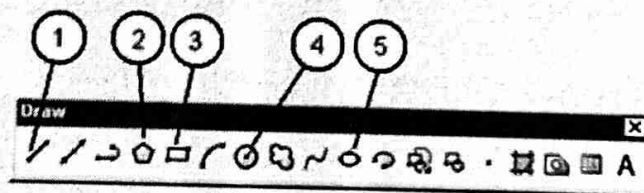
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AutoCAD Interface

AutoCAD Version Number - Shows what AutoCAD version you are running.
 Current open drawing name - Shows the name of the drawing you currently have open.
 Standard Toolbar - Toolbar for standard AutoCAD commands.
 Pulldown Menus - Easy access to AutoCAD commands.
 Layers Toolbar - Access AutoCAD layer commands.
 Edit Toolbar - Access to AutoCAD editing commands.
 Styles Toolbar - Access AutoCAD styles toolbar.
 Properties Toolbar - Access properties toolbar.
 Cursor - Used to point to objects in AutoCAD.
 Draw Toolbar - Access to AutoCAD draw commands.
 Tool Palettes - Access to tool palettes.
 Scroll Bars - Used to scroll around drawing in drawing area.
 Status Bar - Used to turn on and off AutoCAD settings.
 Command Line - Used to type in AutoCAD commands from keyboard.
 Coordinate Readout - Used to keep track of cursor location in drawing area.
 Sheet Set Manager - Access sheet set manager.



Draw Commands



Draw Toolbar used to access AutoCAD draw commands you can also use draw pulldown menu or type the command in at the Command line. The draw commands create objects such as lines, circles, and ellipse's. An object is the smallest component of a drawing. A drawing is made up of a combination of these objects. When creating objects with draw commands, AutoCAD always prompts "Ask" you to indicate points (such as endpoints, centers, or radii) to describe the size and location of the object to be drawn. Drawing commands can be entered from the keyboard (command Line), the Draw Toolbar, or the Draw Pull-down menu.

1. **Line** - Draw lines in AutoCAD
2. **Polygon** - Draws polygons with three or more sides
3. **Rectang** - Used to draw rectangles
4. **Circle** - Command used to draw circles
5. **Ellipse** - Use to draw ellipse

Line Command

Line Command use to draw lines in AutoCAD

- 1 Press **F8** on keyboard to turn on **ORTHO**
- 2 Click on the **LINE** icon in the draw toolbar
- 3 Specify first point: **Pick any point on your screen with the mouse**
- 4 Move your cursor to the right a little do not click down
- 5 Type in: **2 (press enter)**
- 6 Move your cursor up a little do not click down
- 7 Type in: **2 (press enter)**
- 8 Move your cursor to the left a little do not pick down
- 9 Type in: **2 (press enter)**
- 10 Move your cursor down a little do not click down
- 11 Type in: **2 (press enter)**
- 12 **you should have drawn a perfect box see figure 1**
- 13 Press the **ESC** key in the upper left corner of your keyboard to cancel the **LINE** command.



- 1 Click on the **LINE** icon
 - 2 Specify first point: **Pick any point on your screen with the mouse**
 - 3 Move your cursor to the right a little do not click down
 - 4 Type in: **2 (press enter)**
 - 5 Press **F8** on the keyboard to turn off **ORTHO**
 - 6 Specify next point: **Pick point 2 with your mouse**
 - 7 Type in: **C (press enter)**
- you should created something that resembles a triangle see image.**

Polygon Command

Command Use to draw a polygon with three or more sides

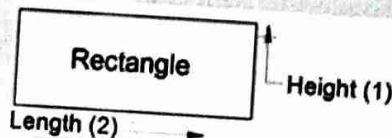
1. **Draw two circles any diameter using the circle icon.**
(Refer to the circle command if you do not know how to use this command)
- 2 Click on the **POLYGON** icon in the draw toolbar
- 3 Enter number of sides: at this point you can enter as many sides as you wish. (No less than three sides). At this time type in: **8 (press enter)**
- 4 Specify center of polygon type in: **CEN (press enter)**
- 5 Move your cursor around the outer edge of one of the circles
until you see a **small yellow circle** at the center of the bigger circle. Hold the cursor there until the word **CENTER** appears then click down with the mouse.
- 6 Enter the option type, type in: **C (press enter)**
7. Specify radius of circle type in: **NEAR (Press enter)**
8. Move the cursor to outer edge of the circle hold it there until you see a **small yellow hour glass** and the word **NEAREST** appears then click down with the mouse.
You may put a polygon within a circle (inscribed) by typing in, in step 6 an "I" instead of a "C"



Rectangle Command

Command used to draw a rectangle

- 1 Click on the **RECTANGLE** icon in the draw toolbar.
 - 2 Specify first corner point: **click anywhere on your screen**
 - 3 Specify other corner: **move your cursor up and to the right any distance you wish then click down.**
 - 4 **Repeat steps 1 and 2**
 - 5 Specify other corner type in: **@3,1 (press enter)**
- Using this option you have entered a specific length and height for your polygon. You may change the numbers to anything you wish but leave the **@** and the **,** in its exact location. Broken down the 3 is the length and the 1 is the height. The **@** symbol tells AutoCAD you are using relative coordinate entry.



Circle Command

Command used to draw circles

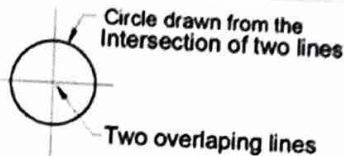
1. Click on the **CIRCLE** icon in the draw toolbar
2. Specify center point of circle: **click anywhere in the drawing area.**
3. Specify radius of circle Type in: **25 (press enter)**

To draw a circle by specifying a circle diameter do the following

1. **Repeat steps 1 and 2.**
2. Specify radius of circle Type in: **D (press enter)**
The **D** stands for diameter
3. Specify diameter of circle Type in: **1 (press enter)**

To draw a circle at the intersection of two lines

1. Draw two lines that overlap using the **line** command
2. Click on the **CIRCLE** in the draw toolbar
3. Specify center point of circle Type in: **INT (press enter)**
4. Move your cursor to the intersection of the two lines until you see a **small yellow X** and the word **INTERSECTION** appears. Then click down
5. Now you can either **type in a radius or type in D for diameter** and move on the next prompt to type in the diameter



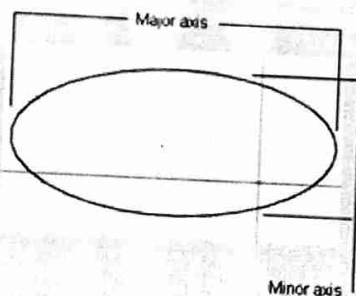
Ellipse Command

Command use to draw ellipses

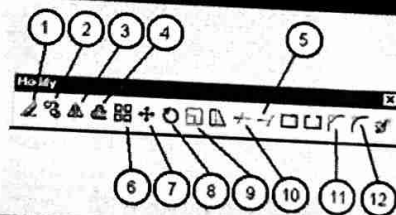
1. Click on the **ELLIPSE** icon in the draw toolbar
2. Specify axis endpoint: **Click anywhere on your screen**
3. Specify other endpoint: **Pick another point a distance you specify to the right of the first point you picked**. This will be the major axis of your ellipse
4. Move your cursor up a distance you specify and click. This will be your minor axis

To draw an ellipse with a center, rotation, and angle do the following

1. **Repeat step 1 above.**
2. Specify axis endpoint of ellipse Type in: **C (press enter)**
3. Specify center of ellipse: **Pick anywhere in the drawing area**
4. Specify the endpoint of axis, move your cursor to the right a little then type in: **.50 (press enter)**.
You have entered the radius of the circle you are trying to make an ellipse from. The radius of the circle is all that is needed.
5. Specify distance to other axis Type in: **R (press enter)**
6. Specify rotation around major axis Type in: **30 (press enter)**
You have entered the rotation angle of the line of sight of the ellipse. For example if you were looking at an ellipse at a 30 degree angle, the rotation would be 30 degrees.



Modify Toolbar



Modify Toolbar used to access AutoCAD draw commands can also use Modify pulldown menu or type the command in at the Command line. After you have created some objects in AutoCAD, objects that make up a technical drawing, such as lines and circles or a combination of both, they are sometimes just not the way you would like them, they may need to be rotated, moved, copied, scaled larger or smaller, etc. To do these things you need to have a good basic understanding of some of the AutoCAD editing commands. In this module are 12 of the most basic AutoCAD editing commands. With these 12 commands you can do 90 percent of most editing operations. Practice these 12 commands learn them well! The best way to access these commands is by using the editing toolbar at the right of the AutoCAD opening screen.

1. **Erase** - Erase object in the drawing area.
2. **Copy** - Used to copy one or more objects.
3. **Mirror** - Command used to mirror an exact duplicate of an object.
4. **Offset** - Used to offset one object from another a distance you specify.
5. **Extend** - Used to extend one line to another.
6. **Array** - Use to make a rectangular or polar array of an object.
7. **Move** - Used to move objects around in the drawing area.
8. **Rotate** - Used to rotate an object around a base point.
9. **Scale** - Command used to make an object larger or smaller.
10. **Trim** - Command used to trim an object from another object.
11. **Chamfer** - Used to put a chamfer between two lines.
12. **Fillet** - Use to put a fillet between two lines a radius you specify.

Erase Command

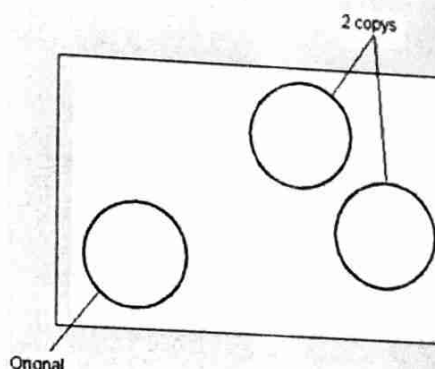
Command used to erase objects in the drawing area

- 1 Draw a line and a circle any length any diameter
- 2 Click on the **ERASE** icon in the edit toolbar
- 3 Select objects: Select all objects that you would like to erase with the pickbox. When you are done selecting objects press **ENTER** on the keyboard. The objects should disappear.

Copy Command

Command used to copy objects in the drawing area

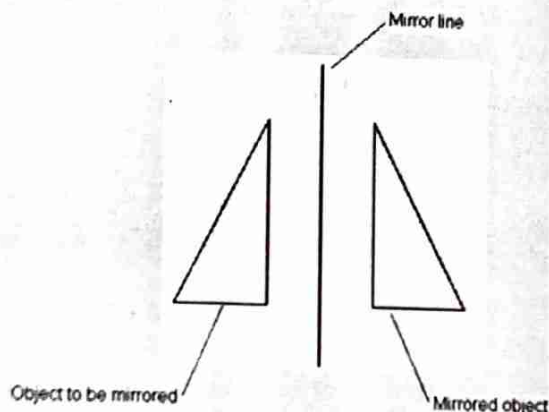
- 1 Draw a circle any diameter
- 2 Click on the **COPY** icon in the edit toolbar.
- 3 Select objects: Select the circle with the pickbox (on the line) when the circle is highlighted press the **ENTER** key on the keyboard.
- 4 Select objects: 1 found
(This line tells that you have selected only 1 object)
Select objects: (This line ask you if you would like to select more objects if not press **ENTER** on the keyboard).
- 5 Specify base point of displacement: Pick with the cursor near the center of the circle.
- 6 Move the object to the location you desire and click down with the mouse.



Mirror Command

Command used to mirror an object to the side of another object

- 1 Draw a rectangle any size using the rectangle command
- 2 Click on the **MIRROR** icon in the edit toolbar
- 3 Select objects: Select the rectangle with the pickbox (on the line)
- 4 Select objects: press **ENTER** on the keyboard.
- 5 Specify point on mirror line: Move your cursor to the right and above a short distance from the rectangle. Click down with the mouse.
- 6 Specify first point of mirror line: Specify second point of mirror line: move your cursor down a short distance then click down with the mouse.
- 7 Delete source objects Type in: **N** (press enter)
An exact duplicate of the rectangle you created in step 2 will be created to the right.
Note: If you create a mirror line above the rectangle an exact duplicate of the rectangle will be created above. You can mirror any object in the drawing area text, lines, circles, views, etc.

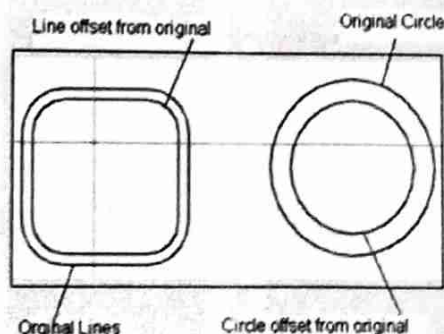


Offset Command

Command used to offset one object from another

- 1 Draw a circle and a line any diameter any length
- 2 Click on the **OFFSET** icon in the edit toolbar.
- 3 Specify offset distance Type in: **.50** (press enter)
- 4 Select object to offset: Select the line with the pickbox.
- 5 Specify point on side to offset: Pick just above the line you have selected in step 4 with the cursor. An exact duplicate of the first line you selected in step 4 is created just above .50 distance away. If you would have picked below the line you picked in step 4 an exact duplicate would be created .50 below.
- 6 Select object to offset: press **ENTER** on the keyboard.

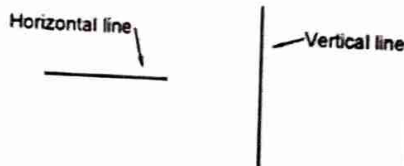
You can offset almost any object in the drawing area. You can offset text. You can also offset a circle to the inside or outside itself. To offset inside a circle click inside the circle. To offset outside the circle click outside the circle.



Extend Command

Command used to extend one line to another

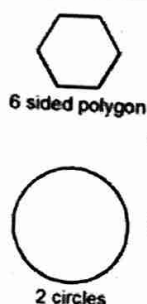
- 1 Draw two lines one horizontal and one vertical
Draw the vertical line a short distance away from the horizontal line. (See image)
- 2 Click on the **EXTEND** icon in the edit toolbar
- 3 Select boundary edges
Select objects: **select the vertical line (the line you want to extend to).**
- 4 Press **ENTER** on the keyboard
- 5 Select objects to extend: **Select the right end point of the horizontal line with the pick box.**
The horizontal line will now extend to the vertical line.
- 6 Press the **ESC** key on the keyboard to cancel the command



Array Command

How to do a rectangular array

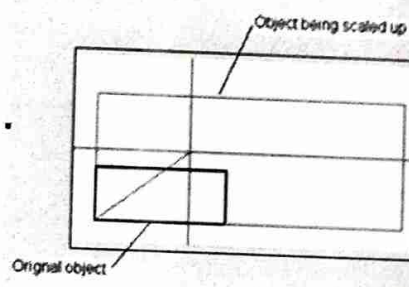
- 1 Start a new drawing from scratch
 - 2 Draw a polygon, 6 sides, inscribed, with a radius of .50.
 - 3 Click on the **ARRAY** icon in the edit toolbar. The array dialog box opens.
 - 4 Set **ROWS** to 6, set **COLUMNS** to 6.
Set **ROW OFFSET** to 1.50, set **COLUMNS OFFSET** to 1.50.
 - 5 Click on **SELECT OBJECTS** icon
 - 6 Select the polygon with the pickbox (on the line). Then press **ENTER** on the keyboard
 - 7 Click on **OK**
- Note: The row and offset distance is taken from the center of the polygon.



Scale Command

Command used to scale an object larger or smaller in size

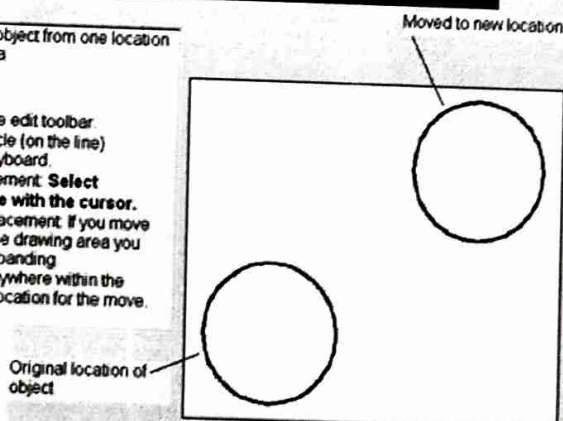
- 1 Draw a circle any diameter
- 2 Click on the **SCALE** icon in the edit toolbar
- 3 Select objects: Select the circle (on the line) then press **ENTER** on the keyboard.
- 4 Specify base point: **Click near the center of the circle with the cursor.**
- 5 Specify scale factor or reference: Type in: 2
press enter on the keyboard. This makes the circle 2 times its original size. If you were to type in .50 it would make the circle half its original size. This can be done with any object created in the AutoCAD drawing area a percentage less than 1 makes the object smaller. A percentage more than 1 makes the object bigger. A percentage of 1 has no effect on the object.



Move Command

Command used to move an object from one location to another in the drawing area

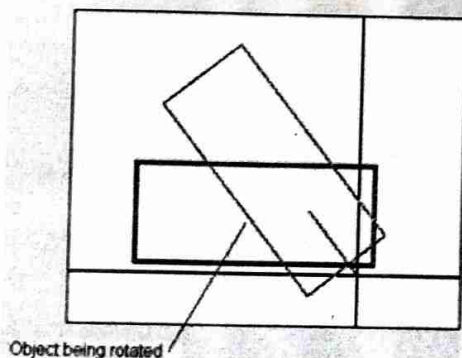
- 1 Draw a circle any diameter
- 2 Click on the **MOVE** icon in the edit toolbar
- 3 Select objects: Select the circle (on the line) then press **ENTER** on the keyboard.
- 4 Specify basepoint of displacement: **Select near the center of the circle with the cursor.**
- 5 Specify second point of displacement: If you move your cursor around a little in the drawing area you can see what is called rubberbanding
- 6 Click down with the mouse anywhere within the drawing area at the desired location for the move.



Rotate Command

Command used to rotate an object around a point you pick

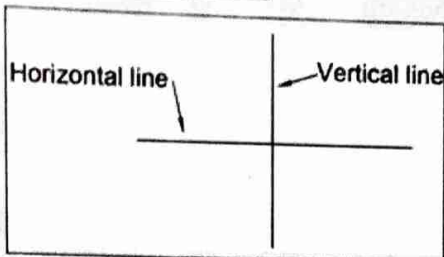
- 1 Draw a rectangle with only two equal sides using the rectangle command.
- 2 Click on the **ROTATE** icon in the edit toolbar.
- 3 Select objects: Select the rectangle (on the line) then press **ENTER** on the keyboard.
- 4 Specify base point: **Select somewhere near the center of the rectangle with the cursor.**
- 5 Specify rotation angle: At this point you can type in an angle of rotation at the command line or by moving your mouse around you can dynamically see the desired rotation angle, then click down with the mouse when you like the rotation angle.



Trim Command

Command used to trim one line back from another line

- 1 Draw two overlapping line one horizontal and one vertical (See image)
- 2 Click on the **TRIM** icon from the edit toolbar
- 3 Select cutting edges. Select objects. **Select the Vertical line with the pick box (this will be your cutting edge).**
- 4 Press **ENTER** on the keyboard
- 5 Select object to trim. **Select the horizontal line the part to the right of the vertical line (this is your object to trim).**
- 6 Press the **ESC** key on the keyboard to exit the command.

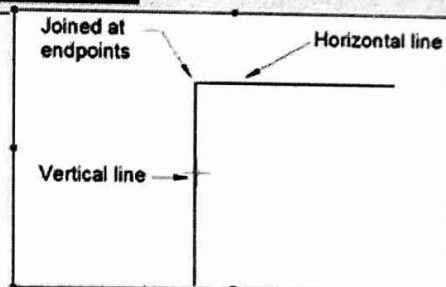


Chamfer Command

Command use to put a chamfer between two connecting lines

- 1 Draw a 1" horizontal line and a 1" vertical line joined at endpoints (See image)
- 2 Click on the **CHAMFER** icon in the edit toolbar.
- 3 Select first line Type in: **D** (press enter)
This is to set the distance of the chamfer
- 4 Specify first chamfer distance Type in: **.25** (press enter)
- 5 Specify second chamfer distance Type in: **.25** (press enter)
- 6 Select first line. **Select the horizontal line somewhere close to the endpoint near the vertical line (But not on the endpoint itself) with the pickbox.**
- 7 Select second line. **Select the vertical line somewhere close to the endpoint near the horizontal line (but do not select the endpoint itself) with pickbox. You should now have a .25 chamfer at 45 degrees.**

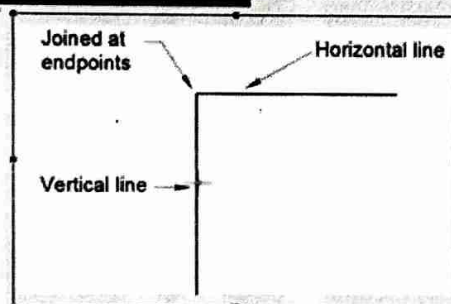
Note: When both chamfer distances are the same the chamfer angle will always be at 45 degrees. If you would like a chamfer at an angle other than 45 degrees just make the two distance settings a different value.



Fillet Command

Command used to put a fillet between two lines

- 1 Draw a 1" horizontal line and a 1" vertical line joined at endpoints (See image)
- 2 Click on the **FILLET** icon in the edit toolbar
- 3 Select first object Type in: **R** (press enter)
This is to set the fillet radius
- 4 Specify fillet radius Type in: **.25** (press enter)
- 5 Select first object. **Select the Horizontal line somewhere near the endpoint close to the vertical line (do not click on the endpoint itself) with the pick box.**
- 6 Select second object. **Select the vertical line somewhere near the endpoint close to the horizontal line (do not pick on the endpoint itself) with the pick box. There now should be a fillet with a radius of .25 between the two lines.**



Coordinate Entry

A good understanding of how co-ordinates work in AutoCAD is absolutely crucial if you are to make the best use of the program. It is an exact way of entering precise points and location within the AutoCAD drawing area, such as the starting and ending points of lines, exact centers of circles and so on. The co-ordinate entry system use in AutoCAD is called the "Cartesian Coordinate System".

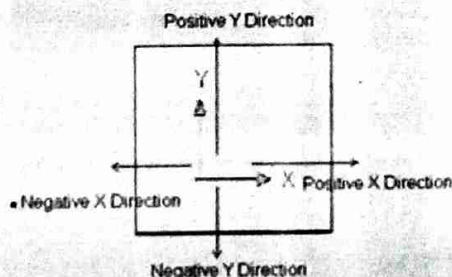
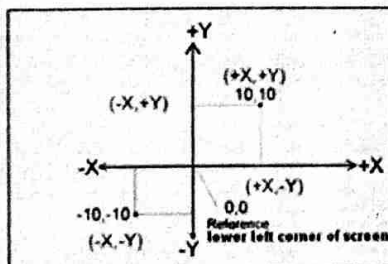
X,Y,Z Co-ordinate Entry System
Angular Measurement

Four most popular way of enter coordinates in autocad

Absolute Coordinate Entry
Relative Coordinate Entry
Polar Coordinate Entry
Direct Distance Entry

X,Y,Z Co-ordinate Entry System

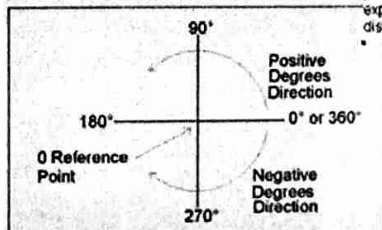
A good understanding of how co-ordinates work in AutoCAD is absolutely crucial if you are to make the best use of the program. The co-ordinate system in AutoCAD is called the Cartesian co-ordinate system. The position of a point can be described by its distance from two axes, X axes and Y axes. The UCS icon in the lower left corner of the drawing area shows you which way the X and Y axes go. In AutoCAD when you enter a coordinate using either absolute or relative coordinate entry, AutoCAD always reads the X axes first and then the Y axes second. Everything you draw in AutoCAD lines, circle, etc. always has an X and Y coordinate location assigned to it. The coordinate readout at the bottom left corner of the screen always tells you where your cursor is at in X,Y. If you move your cursor around the X,Y coordinate readout will change. The lower left corner of your screen is the 0 reference point in the drawing area, this is the origin where the coordinate readout begins counting from. You must understand which way is Y and Which way is X and where the 0 reference point is. The 0 reference point is at the exact intersection of the X and Y on the UCS icon.



Coordinate Entry

AutoCAD by default measure's angles (degrees) counter-clockwise as a positive angle starting from 0 to 360 degrees. If an angle is measured in the clockwise direction this is considered a negative angle starting from 360 to 0. In AutoCAD 0 degrees is the same as 360 degrees, they occupy the same point. 0 or 360 degrees is going to the right, 90 degrees is going straight up, 180 degrees is going to the left, 270 degrees is going straight down. All other angles lie in between the four major angles.

Drawing a line in the positive degrees direction in AutoCAD is easy you just tell AutoCAD how far and at what angle you want to draw the line (Example: (@6<150) draws a line 6 inches long in the positive 150 degrees direction. Drawing a line in the negative direction would look like this (Example: (@4<-30) draws a line 4 inches in the -30 direction. (Refer to polar coordinate entry for a better explanation on how to draw lines at distances and angles.

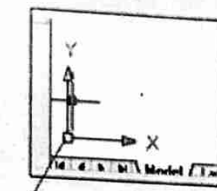


Absolute Coordinate Entry

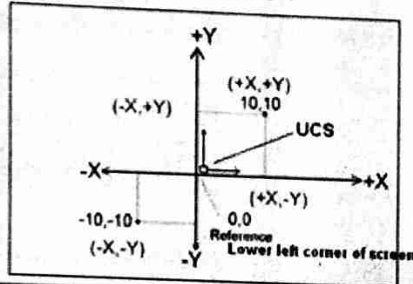
Using this method, you enter the points as they relate to the origin of the WCS (World Co-ordinate System). The origin of the WCS is at the lower left corner of your drawing area, where the UCS icon is. For example you would like to start a line at 10,10 in the drawing area that's 10 on the X axis and 10 on the Y axis. You enter the line command, AutoCAD prompts you to specify first point, you type in: 10,10 and press enter. The line command puts the first point of the line at 10,10 from the 0 reference point in the drawing area, from that point you can enter another point for the second point of the line. To start the first point of the line in the -X and -Y direction, you would enter the line command for first point type in: -10,-10 and press enter. To put it simply all coordinates using the absolute method of entry come relative from the 0 reference point at the bottom left corner of your screen. (Click here to do a short tutorial)

Example's of absolute coordinate entry would be 2,2 -2,1 1,-2 -2,-2

Remember: AutoCAD always reads X axes first then the Y axes.



0.0 Reference Point (origin)



Absolute Coordinate Entry

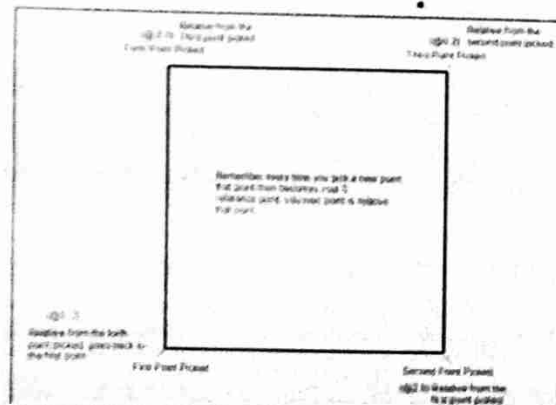
1. Type in: **LINE** (press enter)
2. Specify first point Type in: **2,2** (press enter) starting point.
3. Specify next point type in: **4,2** (press enter) draws a line to the second point
4. Specify next point type in: **4,4** (press enter) draws a line to the third point
5. Type in: **CLOSE** (press enter) Closes the third point to the first point with a line.

Remember: AutoCAD always reads the X coordinate first then the Y coordinate.

Relative Coordinate Entry

The relative coordinate entry method allows you to enter points in reference to the last point picked. You enter the line command and pick the starting point of a line that point then becomes the 0 reference point. You are now prompted to enter the second point of your line. You enter @2,2 AutoCAD then draws a line from the last point you picked to the second point. You are now prompted to enter another point, you type in @3,3 AutoCAD now draws a line relative from the second point to the third point. The @ symbol tells AutoCAD that you are going to use the relative coordinate entry to locate another point, this symbol must always be put in front of the X and Y coordinate. (Example's of relative entry: @2,2, @1,2, @5,5)

(Click here to do a short tutorial)



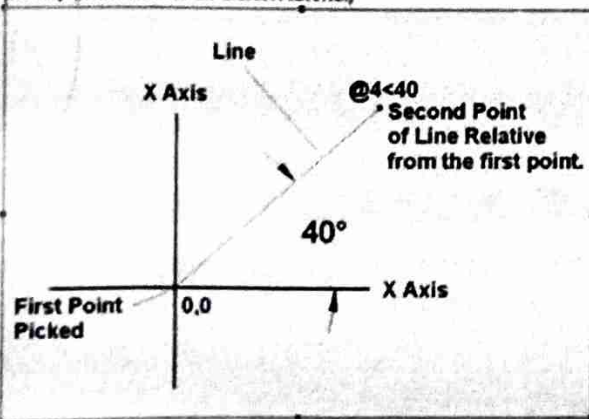
Relative Coordinate Entry

1. Type in: **LINE** (press enter)
2. Specify first point: Pick a point with your input device anywhere in the drawing area.
3. Specify next point Type in: **@2,0** (press enter) draws a line from the first point to the second point.
4. Specify next point Type in: **@0,2** (press enter) draws a line from the second point to the third point.
5. Specify next point Type in: **@-2,0** (press enter) Draw a line from the third point to the forth point in the negative 2 direction.

Remember: In relative coordinate entry each time a new point is picked that point then becomes the 0 reference point.

Polar Coordinate Entry

You would use polar coordinate entry if you know that you want to draw a line a certain distance at a particular angle. Lets say you wanted to draw a line 2 inches at 30 degrees, the polar coordinate entry would look like this @2<30, the @ symbol tells AutoCAD the next point is relative from the last point picked, the 2 tells AutoCAD the line will be 2 inches long, the < tells AutoCAD the next entry will be a degrees, the 30 tells AutoCAD the line will be drawn at 30 degrees. You must use polar coordinate entry in this manner or it will not work. (Examples of polar coordinate entry: @1<90, @4<30, @2<207 and so on) (Click here to do a short tutorial)



Polar Coordinate Entry

1. Type in: **LINE** (press enter)
2. Specify first point: Pick a point anywhere in the drawing area.
3. Specify next point type in: **@2<30** (press enter) Draws a line relative from the first point to the second, 2 inches in the 30 degree direction.
4. Specify next point type in: **@2<150** (press enter) draws a line relative from the second point to the third point, 2 inches in the 150 degree direction.
4. Type in: **CLOSE** (press enter) draws a line from the third point back to the first point to close the profile.

When drawing in AutoCAD you should always try to draw as accurately as possible to do so Object Snap must be used. Object Snap is one of the useful tools found in AutoCAD. It increases accuracy, stability, performance, and productivity. The term object snap refers to the cursor ability to "snap" exactly to a specific point on an object. For example, suppose you want to place a circle at the intersection of two lines. Normally you would try to pick the intersection, but would probably miss. Using object snap intersection you could snap precisely to the intersection of the two lines.

When placing dimensions on a drawing you would most likely use one or two object snaps in combination with each other to do so. Go the rest of the story is use object snaps whenever possible when drawing or placing dimension on an object. Object snaps can be turned on in groups using the drafting settings dialog. This is called running object snaps. For example before you start drawing you know you will be drawing at intersection, so endpoint, to center of circles and so on, you can turn them all on at one time. When ever you pass these points on an object the object snap for that point will automatically turn on. To turn osnaps on and off use the osnap button in the status bar at the bottom of the screen. When the button push in it is turned on, when it is out it is turned off.

Osnap ENDPPOINT draws a line from the endpoint of a line to another end point of a line.

Osnap INTERSECTION snaps to the intersection of two intersecting lines.

Osnap NEAREST snaps nearest to any point you pick on a line.

Osnap MIDPOINT snaps to the exact midpoint of a line.

Osnap TANGENT snaps tangent from a circle or arc to another circle or arc.

Osnap CENTER snaps to the exact center of a circle or arc.

USING OSNAPS INDIVIDUALLY

Osnap Intersection

How to draw using osnap intersection

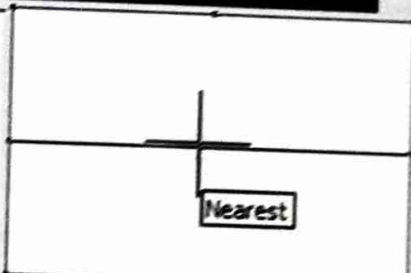
1. Draw 2 overlapping lines (see image)
2. Click on the **LINE** icon in the draw toolbar
3. Specify first point. Move your cursor over to the intersection of the intersection line and click down when you see the yellow osnap intersection X at these intersection
4. Move your cursor out a short distance and click and click down to end the line
5. Press the **ESC** key on the keyboard to cancel



Osnap Nearest

How to draw using osnap Nearest

1. Draw a horizontal line any distance long
2. Click on the **LINE** icon
3. Specify first point. Move your cursor over the horizontal line until you see the yellow hour glass. You can click down anywhere along that line where you see the yellow hour glass that is the osnap nearest. Click down at any convenient location.
4. Move your cursor up a short distance and click down
5. Press the **ESC** key on the keyboard to end the line



Osnap Midpoint

How to draw using osnap midpoint

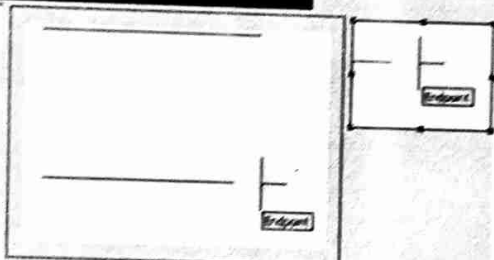
1. Draw a horizontal line any length
2. Click on the **LINE** icon in the draw toolbar
3. Specify first point. Move your cursor along the horizontal line until you see the yellow osnap midpoint triangle then click down
4. Move your cursor up a short distance and click down to end the line
5. Press the **ESC** key on the keyboard cancel



Osnap Endpoint

How to draw using osnap endpoint

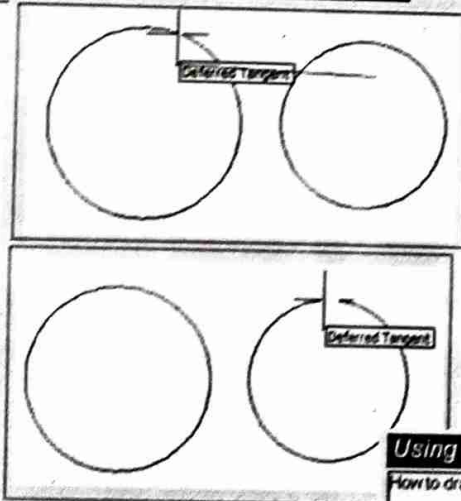
1. Draw two horizontal lines a short distance away from each other
2. Click on the **LINE** icon in the draw toolbar
3. Specify first point. Move your cursor to the lower right endpoint of the bottom line and click down when you see the yellow osnap endpoint box with the tooltip that says endpoint.
4. Move your cursor up to the endpoint of the line above and click down when you see the yellow osnap endpoint box.
5. Press the **ESC** key on the keyboard to cancel.



Osnap Tangent

How to draw using osnap Tangent

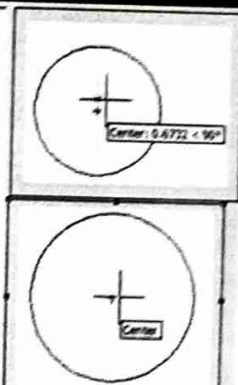
1. Draw 2 circle any diameter
2. Click on the **LINE** icon
3. Specify first point Type in **TAN** (press enter) Move your cursor over to the circle on the right (on the line) until you see the yellow osnap DEFERRED TANGENT point then click down
4. Specify second point Type in **TAN** (press enter) Move your cursor to the circle on the other side (on the line) until you see the yellow osnap DEFERRED TANGENT point then click down. A line should then draw tangent between the two circles
5. Press the **ESC** key on the keyboard to end the line



Osnap Center

How to draw using osnap Center

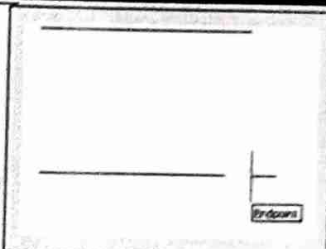
1. Draw a circle with any diameter
2. Click on the **LINE** icon in the draw toolbar
3. Specify first point. Move your cursor to the center of the circle you created step in 1. Click down when you see the small yellow osnap center circle at its center.
4. Move your cursor out a short distance and click down to end the line
5. Press the **ESC** key on the keyboard to cancel



Using Osnap Individually

How to draw using osnap's individually

1. Draw two horizontal lines on 1" or 2" apart
2. Turn off running object using the status bar **OSNAP** button, it should be out
3. Click on the line icon in the draw toolbar
4. Line specify first point. Type in: **END** (press enter)
5. Click on the bottom line on the right end
6. Specify next point. Type in: **END** (press enter)
7. Specify next point. Type in: **END** (press enter)
8. Click on the top line on the right end
9. Press the **ESC** key to cancel the command



Any osnap command can be use individually by typing it in at the command. When AutoCAD ask you to pick a point in a drawing, think about what osnap to use for that situation.

New/Open/Save/Exit

Here you are given some of the ways of opening and closing an AutoCAD drawing session. How to start a new drawing from scratch. Also how to save a drawing to a drive or directory of your choosing.

- Qnew** - Starts a brand new drawing from scratch
- Open** - Used to open an already existing drawing
- Save** - Save a drawing to a drive and directory of your choice for later use
- Exit** - Used to exit out and close AutoCAD

Qnew Command

The Qnew command is used to quickly create a new drawing. By clicking on this icon the select template dialog box opens, from there you may create a new drawing from scratch "A blank piece of paper". This is the fastest way of starting a new drawing.

1. Click on the **QNEW** icon at the upper left corner of your screen in the standard toolbar.
2. Click on the **ARROW Down**
3. Click on **OPEN WITH NO TEMPLATE - IMPERIAL**

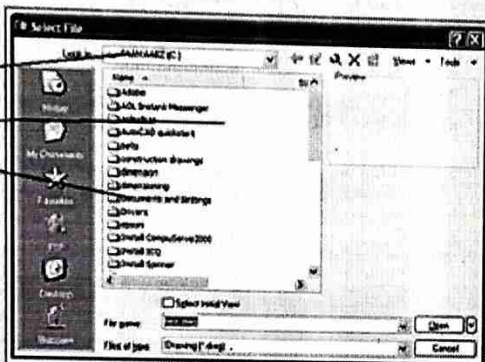
OPEN WITH NO TEMPLATE - IMPERIAL sets AutoCAD up to draw in decimal inch. If you wish to draw in metric units click on **OPEN WITH NO TEMPLATE-METRIC**



Open Command

The open command is used to open an existing drawing already saved from a previous drawing session.

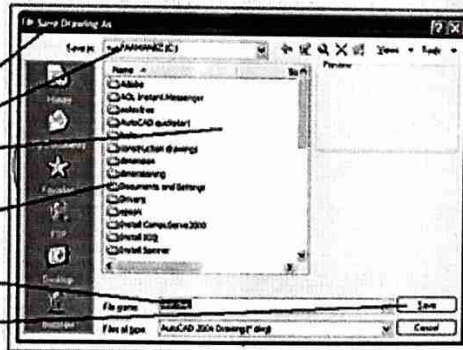
1. Click on the **OPEN** icon in the upper left corner of your screen in the standard toolbar.
2. The **SELECT FILE** dialog box will open.
3. Click here next to **LOOK IN** and you will see a drop down list of drives on your computer such as **A:, B:, C:, D:** and so on.
4. Click on the drive your drawing is located on.
5. Scroll down the list of directories using the scroll bars to the right, find the directory your drawing is in and double click on that directory.
6. Once you have located your drawing you wish to open double click on it and it will open.



Save Command

The save command is used to save the current open drawing. Use this command to save your drawing when you are ready to close your current drawing session or start a new one.

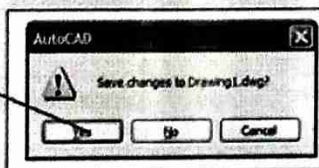
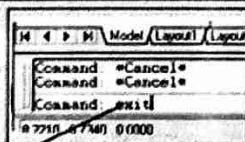
1. Start a new drawing from scratch
2. Draw a circle and a line any length any diameter
3. Click on the **SAVE** icon in the upper left corner of your screen in the standard toolbar. The **SAVE DRAWING AS** dialog box opens.
4. Click here next to **SAVE IN** scroll down the list of drives on your computer and click on the drive you wish to save your drawing on (Example: **A:, B:, C:, D:**, etc).
5. **NOTE:** Once you have click on the drive you wish to save your drawing on, you may get a list of directory's you can click on a specified directory of your choice to save your drawing in.
6. **REMEMBER WHERE YOU SAVED YOUR DRAWING**
7. Click on this area next to **FILE NAME** then type in a name for your drawing (Example: **TEST**)
8. Click on **SAVE**, the drawing file will then be saved to the drive and directory that you chose in step 4.



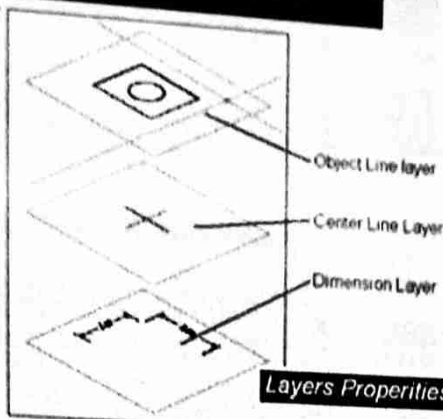
Exit Command

This is the best method to use when you want to exit AutoCAD. If any changes have been made to the drawing since you last saved it, exit invokes a warning box asking if you want to save changes to the current open drawing before ending.

1. Type in at the command line: **EXIT** (then press enter)
2. A warning sign may or may not pop-up depending if you made any changes to your drawing since the last time you save it. If a warning sign does pop-up make you click on **YES** to save your changes. If you save yes to save changes the changes will be saved back the drawing that is currently open.

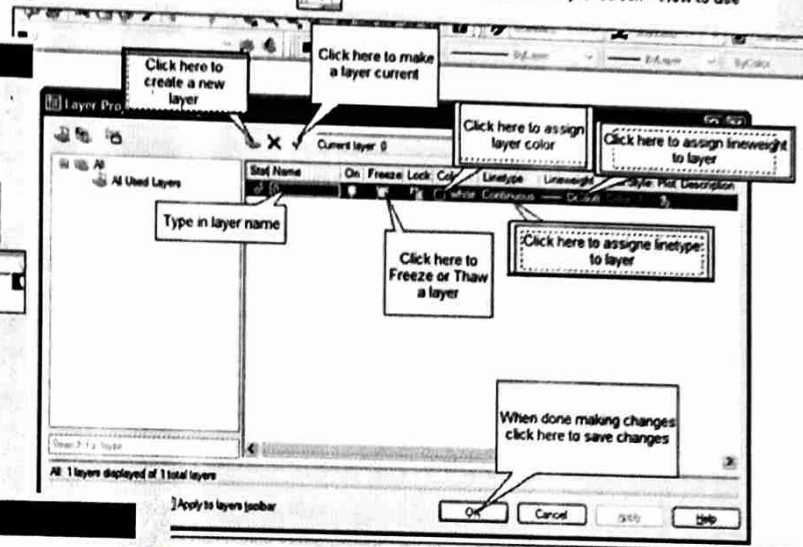


In a CAD drawing, layers are used to group related objects in a drawing for viewing purposes or editing purposes. For example in a mechanical drawing you could have object lines on a layer named object or dimension lines on a layer named dimensions and phantom lines on a layer named phantom. In an architectural drawing you could have the floor plan on floor plan layer and the electrical on a layer named electrical and so on. Layers can be turned on or off to view only certain layers, they can be assigned different colors, linetypes, and lineweights. Layers are used mostly for viewing purposes. Just imagine you car, each major area of your car is on a different layer, your car body is on body layer, your chassis is on chassis layer, your engine is on engine layer. You turn off body layer, you can now see your engine and chassis without the car body obstructing your view. There can be an unlimited number of layers in an AutoCAD drawing.



Layers Properties Manager

This dialog box is used to control your layers turn on, turn off, make them current when ready to draw on, etc. To open this dialog box click on the layer icon in the layers toolbar "upper left on your screen" How to use



Layer Properties Manager Dialog Box

Create New Layers

Use this procedure when you want to create new layers

- 1 Click on the **LAYER** icon in the upper left corner of your screen
- 2 Click on the **NEW** button
- 3 Type in the **LAYER NAME** (Press enter on the keyboard)



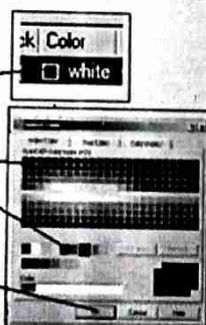
Repeat step 2 and 3 if you need to create more than one layer. If you desire to leave the layer control box after you have created your layers don't forget to click on OK when you leave this will save your layers you have just created or else you will lose them.

Layer 0 is the default AutoCAD layer it is always created when starting a new drawing

Set Layer Color

This procedure is used to assigned a color to a layer. Once you assign a color to a layer everything created on that layer will take on the color assigned to that layer.

- 1 Under the color heading who's layer's color you wish to change click on the white icon.
- 2 Select a **COLOR** from the color palette, you may select any color you wish to assign to that layer
- 3 Click on **OK** to close and save

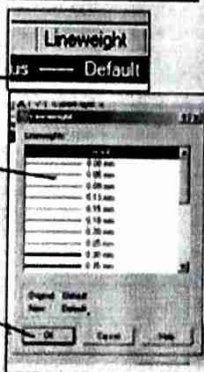


White is the AutoCAD layer default layer color it is created everytime a new layer is created.

Set Lineweight

This procedure is used to assign a line thickness to the linetype you assigned to that layer

- 1 Under the lineweight heading who's layer's lineweight you wish to change, click on the **DEFAULT**.
- 2 Scroll down the list of **LINWEIGHTS** and click on the desired lineweight to assign to the linetype assigned to that layer.
- 3 Click on **OK** to close and save



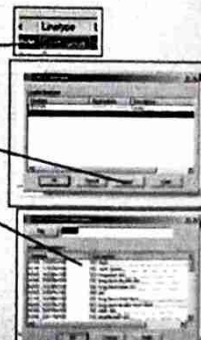
The default lineweight is the AutoCAD default lineweight it is created everytime a new layer is created. To have the lineweight display on your screen click on the LWT button in the status bar at the bottom of your screen. When the button is in the in position that option is turned on

Set Linetype

Use this procedure when you want to assign a particular linetype to a layer for use in your drawing

- 1 Under the linetype heading who's layer's linetype you wish to change, click on **CONTINUOUS**
- 2 The **SELECT LINETYPE** dialog box will appear, click on **LOAD**
- 3 The **LOAD AND RELOAD LINETYPES** dialog box will appear. Scroll down the list of linetypes and double click on the desired linetype you wish to load
- 4 The **SELECT LINETYPE** dialog box will reappear, click on the linetype you selected in step 3, then click on **OK** that linetype then becomes assigned to that layer.

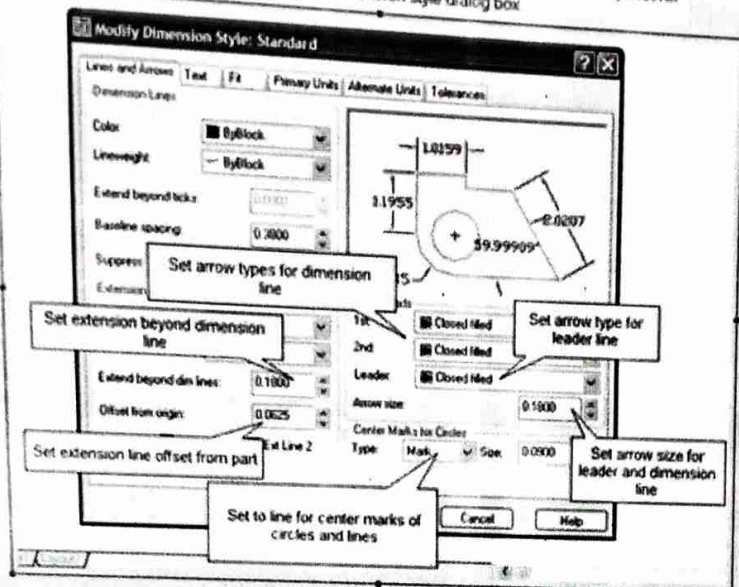
Continuous linetype is the AutoCAD default layer linetype it is created everytime you create a new layer



Dimensioning

To make dimension setting in preparation for dimensioning a drawing click on the STYLE... Option in the dimension pulldown menu at the top of the screen. Then click on the MODIFY button to open the dimension style dialog box.

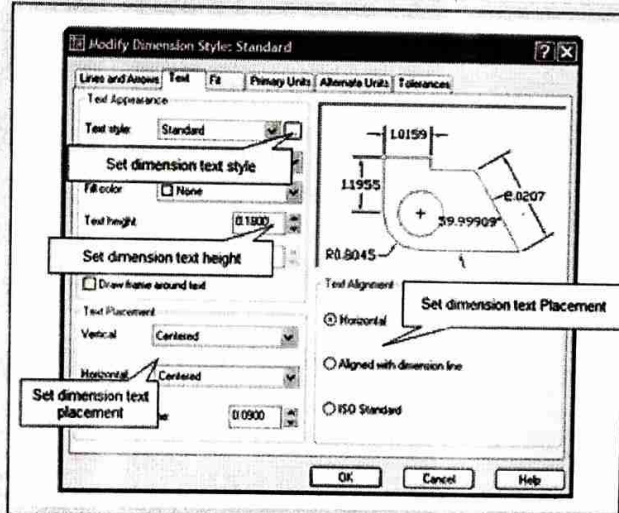
Set lines and arrows
Set dimension text style and height
Set dimension units
Using dimensions



Dimensioning

To make dimension setting in preparation for dimensioning a drawing click on the STYLE... Option in the dimension pulldown menu at the top of the screen. Then click on the MODIFY button to open the dimension style dialog box.

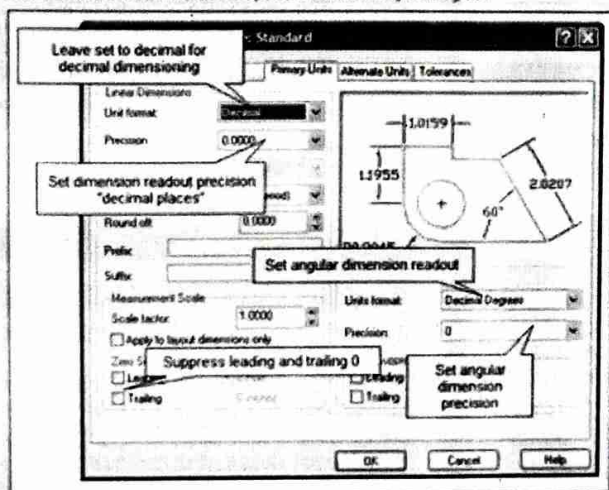
Set lines and arrows
Set dimension text style and height
Set dimension units
Using dimensions



Dimensioning

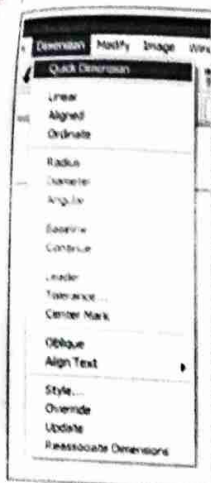
To make dimension setting in preparation for dimensioning a drawing click on the STYLE... Option in the dimension pulldown menu at the top of the screen. Then click on the MODIFY button to open the dimension style dialog box.

Set lines and arrows
Set dimension text style and height
Set dimension units
Using dimensions



ing Dimensions

After you have made your dimension settings in the dimension style dialog box and you are now ready to dimension your drawing, click on the DIMENSION pull-down menu scroll down the list of dimension commands and click on the dimension command you wish to use. Click on the OSNAP button in the status bar at the bottom of your screen so you can dimension with accuracy.



- Linear** - Specify by picking two points on an object then pick a location for dimension.
- Aligned** - Specify by picking two points on an angle line then pick location for dimension.
- Radius** - Specify by picking a radius on an object then picking leader location.
- Diameter** - Specify by picking a circle then picking leader location.
- Angular** - Specify by picking two lines then pick location of dimension.
- Leader** - Specify by picking on the object you want the leader to point at then pick leader location.
- Center Mark** - Specify by picking on circle or radius to apply center marks to.

The above are the basic dimension commands there are more but these are the basics. If you have turned on the OSNAP on the status bar at the bottom of your screen turn it off now. When using dimension commands always watch your command for further instruction "Always".

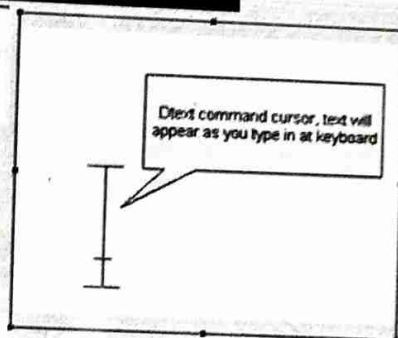
Editing Dimensioning Text, Editing Dimensions with grips, Changing Dimension Settings.

Detext Command

The Dtext command places individual lines of text in a drawing and allows you to see each letter as it is typed. You may enter multiple lines of text without exiting the dtext command by pressing the enter key when you get to the end of one line, it will then rap to the next line. Pressing the spacebar on the keyboard will put a spacing between letters and words.

1. Type in: **DTEXT** then press **ENTER** on the keyboard.
2. Specify start point of text: Click anywhere in your drawing area where you want your text to start, pick with the mouse.
3. Specify height: Type in the height that you want your text to be then press **ENTER** on the keyboard.
4. Specify rotation angle of text: Type in: **0** (press enter). This sets the rotation of the text.
5. Enter text: Type in the text you desire then press **ENTER** on the keyboard. If you desire more than one line of text press enter again to type in another line of text.
6. When you are done typing in the desired text press **ENTER** on the keyboard twice.

NOTE: If you wish to enter text in another area of your drawing without exiting the dtext command, before you do step 6 click in another area of the drawing with your mouse then start typing in again, when done do step 6.



Text In A Drawing

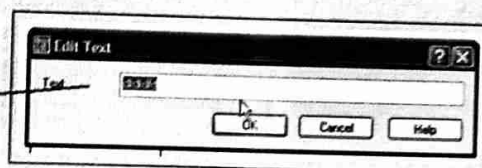
In this book you learn one way of putting text into a drawing "Single line text" and how to edit it. This is only one way there are others, this is a good start for a beginner.

Dtext
Dedit

DDedit Command

The Ddedit command invokes a dialog box for editing single line text. It only allows you to edit the characters, not the height or style. It is a useful command when you want to edit missed spelled word in a single line text.

1. Type in: **DDedit** (Press enter)
 2. Select an annotation object with the mouse select the line of text you wish to edit.
 3. The **EDIT TEXT** box will open displaying the text you selected in step 2. Using the keyboard edit the text in the box. When done editing click on **OK** to save changes. The text will now update in the drawing.
- You may select another line of text at this or press the **ESC** key to cancel the command.



Zoom Commands

To zoom means to "magnify" make larger or small a segment or area of a drawing. To "zoom out" means to display a larger area of a drawing. To "zoom in" means to make a smaller area of a drawing larger as to see more detail. Zooming does not change the size of the drawing object, zooming only changes the display of the objects. Zooming is like holding an object in your hand, you move the object closer to your eyes you are "zooming in" to see more detail, if you move the object away from your eyes you are "zooming out" you see less detail but you see more of the object in its entirety.

Zoom Realtime
Zoom Window
Zoom Previous
Zoom All
Pan Realtime

Zoom Realtime

The "zoom realtime" command is used when you would like to zoom in on a specific location in your drawing. You can also use this zoom realtime to

1. Draw a circle and a line any diameter any length.
2. Click on the **ZOOM REALTIME** icon located in at the top of the screen in the standard toolbar menu area. Move your cursor down into the drawing area your cursor will change into Magnifying glass with a + at the top and a - at the bottom.
3. Click down with the left mouse button and hold it down move your cursor in the direction of the + you will get closer to the objects "you are zooming in". Move your cursor in the direction of the - you will go further away "you are zoom out" from the objects.

Press the **ESC** key on the keyboard when in the desired zoom magnification

Zoom Window

The "zoom window" command is used to zoom in on a specific area in your drawing by opening up a window around the specified windowed area or object.

1. Draw a circle and a line any diameter any length.
 2. Click on the **ZOOM WINDOW** icon at the top of the screen in the standard toolbar menu area.
 3. Specify first corner. Pick a point to the left and just below the line.
 4. Specify opposite corner. Pick a point just above and to the right of the line.
- You have zoomed on just the line by specifying a zoom with a window option. This can be done anywhere within the drawing area.

STOP HERE click on the **BACK** button on this page to go back to the **STANDARD TOOLBAR** page and click on the **ZOOM PREVIOUS** icon.

Setting Up Grips

The **GRID** command places a pattern of dots on the screen at any spacing. This command is used as a drafting aide.

1. Type in **GRID** (Press enter on the keyboard)
2. Type in **.25** (Press enter on the keyboard)

You may set the grid spacing to any size you wish. Start out with a .25 spacing then adjust as needed. You can use the **GRID** button in the status bar to turn on and off grid.

Setting Snap

When you move your pointing devices, the cursor crosshairs move freely on the screen. Sometimes it is hard to place a point accurately. The **snap** commands allows the cursor to move only in exact increments.

1. Type in **SNAP** (Press enter on the keyboard)
2. Type in **.25** (Press enter on the keyboard)

You may set the Snap spacing to any size you wish. Start out with a .25 spacing then adjust as needed. It is a good idea to keep the grid spacing and snap spacing the same to avoid confusing. You can use the **SNAP** button in the status bar to turn on and off snap.

Zoom All

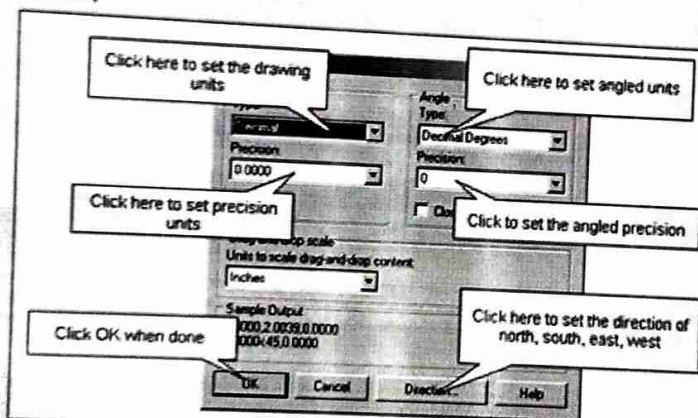
The **"zoom all"** command when used, displays all object within the drawing area.

1. Draw so objects on the screen, some lines ect.
2. Zoom in on the objects using the zoom window option of the zoom command
3. Type in **ZOOM** then press enter
4. Type in **ALL** then press enter

Units Command

When drawing in autocad you have the option of drawing in many different types of drawing units such as decimal units for mechanical drawings and architectural units for architectural drawings. For drawing in metric units the scale factor is 25.4. So here's what you do when starting a new drawing and you want to draw it in metric. There is no metric settings in autocad you have to convert all settings using the 25.4 scale factor "Everything". For example the limits command the lower left corner is 0,0, but the upper right corner is 17,11. "B" size sheet. You multiple the 17 by 25.4 then you multiple the 11 by 25.4 this gives you the limits metric equivalent to a "B" size sheet. "Do this for every setting you make". Once you make all settings for metric you can use distances. For example when using the line command a distance of 50mm is entered as 50.

1. Type in **UNITS** (Press enter on the keyboard)
2. Under **TYPE** click on **DECIMAL**
If you wish Architectural units click on Architectural
3. Under **PRECISION** click on **0.0000**
You may set the precision to any precision you wish. Start out with 2 or 3 decimal places then adjust as needed.
4. Click on **OK** to close and save settings



Setting Limits

The **limits** command is used to set the area to drawn in. For example you have chosen a "B" size sheet of paper to draw on. The dimension for a "B" size sheet of paper are 11 X 17, so then you would set your limits to 0,0 for lower left corner, for upper right corner you set to 17,11 (just the reverse of 11X17). Remember autocad always reads X direction first and Y direction second. Use the UCS icon at the lower left corner as a reference. After you have set your limits to the paper size your going to use to draw on, draw the outline of the paper using the line command.

1. Type in **LIMITS** (Press enter on the keyboard)
2. For **LOWER LEFT CORNER** type in: **0,0** (Press enter on the keyboard)
3. For **UPPER RIGHT CORNER** type in the dimension of your sheet size (Example **17,11** for B size then press enter on the keyboard)

For sheets sizes of A,B,C,D,E set the upper right corner to:

- A size = 11,8.5
- B size = 17,11
- C size = 22,17
- D size = 36,24
- E size = 44,36

Leave the lower left corner to 0,0 (always)

Ltscale

The **ltscale** (linetype scale) set the length of dashes in linetypes having them. The **ltscale** command works only on lines with dashes and spaces in them such as hidden, dashed, phantom, center, etc.

Ltscale Factor	Center line
1.50	-----
1.00	-----
.50	-----

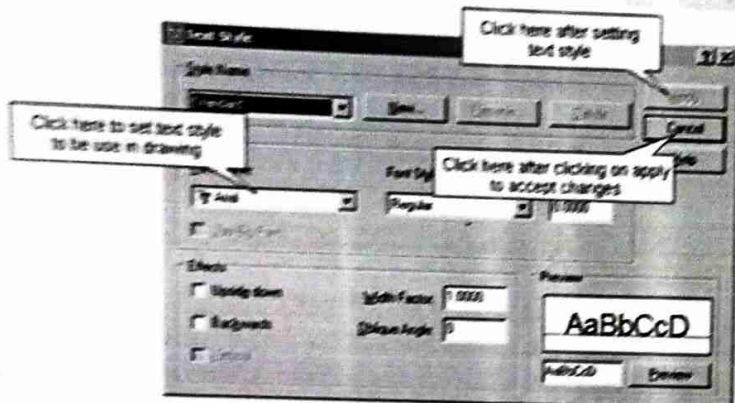
1. Type in **LTSCALE** (press enter on the keyboard)
2. Type in **.7** (press enter on the keyboard)

Play with this command to get feel on how autocad determines line scale factors.

Set Text Style

The style command is used to set a font or text style to be used in a drawing.

1. Type in **STYLE** (press enter on the keyboard).
2. Scroll down the list until you find the desired **TEXT STYLE** and click on it.
3. After you have click on the desired text style the **APPLY** button will then turn white.
4. Click on **APPLY**.
5. After you click on apply the cancel button will change into a **CLOSE** button. Click on **CLOSE** to save the text style to be used in your drawing.



Turn On LWT

The lwt (lineweight) button in the status bar at the bottom of the screen is used to show lineweights that were assigned to layers in the layer control manager dialog box, on the screen. For example you created a layer call object layer and assigned it a continuous linetype, and a lineweight of 35mm. In order for you to see the lineweight on your screen you would have to turn on the LWT button in the status bar at the bottom of the screen.

1. Click on the **LWT** button in the status bar at the bottom of the screen.

Undo/Redo

The undo command undoes the last command you did. If you just drew a line and wanted to undo it, click on the undo icon.

1. Draw a line any length in the drawing area using the line command.
2. Click on the undo icon at the top of the screen, the line is no more. (Go onto redo).



The redo command undoes an undo. For example you just invoked the undo command to undo a line you just had drawn and now you decided you wanted that line after all, click on the redo command to get it back again.

1. Click on the redo icon at the top of the screen to bring back the line you undone using the undo command. Presento the line is back.

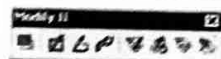
Putting It All Together

"Putting it all together" The logical sequence of things to do when starting a new drawing. If you are opening an already existing drawing from a previous drawing session then there is know need to do the following.

1. Start a new drawing using the **QNEW** command.
2. Go thru the "Typical Drawing Setup" section in this book.
3. Make dimension settings thru the dimension style manager dialog box.
4. Draw a border and titleblock if you haven't already.
5. You are now ready to start the drawing process. The first things you start to draw in autocad are usually lines or in drafting terms they are called "Object Lines" so you should have a layer called "Object Lines" created, if not create it now. Make the object layer current. Once you have made the object layer current go ahead and start drawing object lines using the line command (after you have make "Object Lines" your current layer make sure you click on OK before leaving the layer control dialog box).
6. After you have drawn your object put dimensions and text in there places.
7. Plot your drawing or save it for later.

Toolbars

Toolbars are used to easily access autocad commands. Toolbars can be turned on or off by doing the following. Right-click any toolbar and click a toolbar on the shortcut menu.



1. Move your cursor over any toolbar and right click your right mouse button.
2. Move down the menu and click on the toolbar you wish to open, it then appears in the drawing area.

NOTE: The standard toolbars that are open when you first open AutoCAD are: **DRAW, LAYERS, MODIFY, PROPERTIES, STANDARD, STYLES, INSERT.**

When the toolbar appears in the drawing area move your cursor over the blue bar in the toolbar, click and hold down the left mouse button. Move the toolbar to a location at the edge of the screen and let up on the mouse button. This is called docking the toolbar.

Keyboard Function Keys

The ESC key and the F8 keys have special functions in AutoCAD

- ESC** - This is the command cancel key. When ever your in a command and just need to start over press this key, it cancels the current command you are in.
- F1** - Opens the AutoCAD help dialog box.
- F2** - Opens the AutoCAD text window. In this window you can scroll through the history of commands.
- F3** - Turns running osnap on or off
- F4** - Turns tablet on or off (You will probably never use this key)
- F5** - Switches between ISOPLANES (top,front,right)
- F6** - Turns coordinate readout at lower left of screen on or off
- F7** - Turns Grid display on or off
- F8** - Turns ORTHO on or off (ortho is used in conjunction with the line to draw straight horizontal and vertical lines.
- F9** - Turns SNAP on or off

Drawing the Plan of a Building:--Planning Your Work A drawing plan involves thinking about the entire process or project in which you are involved and determining how to approach it. Your drawing plan focuses on the content you want to present, the objects and symbols you intend to create, and the appropriate use of standards. You may want processes to be automatic or to happen immediately, but if you hurry and do little or no planning, you may become frustrated and waste time while drawing. Take as much time as needed to develop drawing and project goals so that you can proceed with confidence.

During your early stages of AutoCAD training, consider creating a planning sheet, especially for your first few assignments. A planning sheet should document the drawing session and all aspects of a drawing. A freehand sketch of the drawing is also a valuable element of the planning process. The drawing plan and sketch help you establish: v

1. Drawing layout: area, number of views, and required free space
2. Drawing settings: units, drawing aids, layers, and styles
3. How and when to perform specific tasks
4. What objects and symbols to draw
5. The best use of AutoCAD and equipment
6. An even workload

Drawing Standards:--

Most industries, schools, and companies establish standards. Drawing standards apply to most settings and procedures, including: ---

1. File storage, naming, and backup
2. Drawing template, or template, files
3. Units of measurement
4. Layout characteristics
5. Borders and title blocks
6. Symbols v Layers
7. Text, dimension, multileader, and table styles
8. Plot styles and plotting

Company or school drawing standards should follow appropriate national industry standards whenever possible. Although standards vary in content, the most important aspect is that standards exist and are understood and used by all CADD personnel. When you follow drawing standards, your drawings are consistent, you become more productive, and the classroom or office functions more efficiently. This textbook presents mechanical drafting standards developed by the American Society of Mechanical Engineers (ASME) and accredited by the American National Standards Institute (ANSI). This textbook also references International Standards Organization (ISO) mechanical drafting standards and discipline-specific standards when appropriate, including the United States National CAD Standards(NCS)

Drawing an ARC:--An arc is one of the most basic objects you can create. On the Home ribbon, in the Draw panel, when you expand the Arc tool you can see that there are 11 methods for creating arcs. With the exception of the Continue option, all of these methods require you to specify either three points or two points and a value, such as the radius, chord length, or tangent direction. The default method is to create an arc that passes through three points. When you choose the 3-Point option, the program prompts you for the starting point of the arc, and also tells you that the arc will be created in a counter-clockwise direction. If you press and hold the CTRL key, you can create the arc in a clockwise direction. Click to select the start point and then the second point. As soon as you specify that second point, you can see a preview image of the arc. As you move the cursor, the preview changes, so that the arc extends from the start point and through the second point to the position of the cursor. The first two points remain fixed and it's the third point, the end point, that completes the creation of the arc. Once the arc has been created, if you select it, grips appear at specific locations that correspond to the geometry used to store the arc. The program stores the start point, the end point, and the center point of the arc. There's also a grip at the midpoint. Regardless of the method you use to create the arc, once it has been created, the program uses the start point, the end point, and the center point to store the definition of the arc.

Draw triangle in autocad:-- To draw a triangle in autocad we will follow the following steps:--

1. Command format

Keyboard: line

Menu: draw > line

Toolbar: home >

2. Steps

Command: _line

Specify first point: 0,0 // enter coordinate of first point

Specify next point or [Undo]:@100,0 // specify second point with relative rectangular coordinates

Specify next point or [Undo]:@100<120 // specify third point with relative polar coordinates

Specify next point or [Close/Undo]:c // close the pattern