DEPARTMENT MECHANICAL ENGINEERING

CADD and MAT
LAB MANUAL

SUBJECT NAME	**Kinematics and Dynamics of Machinery Lab**
SUBJECT CODE	**2050382**
COURSE-BRANCH	**B. Tech - Mechanical Engineering**
YEAR-SEMESTER	**III - II**
ACADEMIC YEAR	**2022-2023**
REGULATION	**MLRS-R20**

MARRI LAXAMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT

MISSION AND VISION OF THE INSTITUTE:

Our Vision:

To establish as an ideal academic institution in the service of the nation the world and the humanity by graduating talented engineers to be ethically strong globally competent by conducting high quality research, developing breakthrough technologies and disseminating and preserving technical knowledge.

Our Mission:

To fulfill the promised vision through the following strategic characteristics and aspirations:

- Contemporary and rigorous educational experiences that develop the engineers and managers;

- An atmosphere that facilitates personal commitment to the educational success of students in an environment that values diversity and community;

- Prudent and accountable resource management;

- Undergraduate programs that integrate global awareness, communication skills and team building across the curriculum;

- Leadership and service to meet society's needs;

- Education and research partnerships with colleges, universities, and industries to graduate education and training that prepares students for interdisciplinary engineering research and advanced problem solving;

- Highly successful alumni who contribute to the profession in the global society.

Vision and Mission statements of the Department of Mechanical Engineering:

Vision Statement:

"The Mechanical Engineering Department strives immense success in the field of education, research and development by nurturing the budding minds of young engineers inventing sets of new designs and new products which may be envisaged as the modalities to bring about a green future for humanity"

Mission Statement:

1. Equipping the students with manifold technical knowledge to make them efficient and independent thinkers and designers in national and international arena.

2. Encouraging students and faculties to be creative and to develop analytical abilities and efficiency in applying theories into practice, to develop and disseminate new knowledge.

3. Pursuing collaborative work in research and development organizations, industrial enterprises, Research and academic institutions of national and international, to introduce new knowledge and methods in engineering teaching and research in order to orient young minds towards industrial development.

PROGRAM EDUCATIONAL OBJECTIVE

PEO 1: Graduates shall have knowledge and skills to succeed as Mechanical engineers for their career development.

PEO 2: Graduates will explore in research.

PEO 3: Mechanical Graduates shall have the ability to design products with various interdisciplinary skills

PEO 4: Graduates will serve the society with their professional skills

PROGRAM OUTCOMES

A. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization for the solution of complex engineering problems.

B. Problem Analysis: Identify, formulate, research, review the available literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural science and engineering sciences.

C. Design and development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specific needs with appropriate considerations for public health safety and cultural, societal and environmental considerations.

D. Conduct investigations of complex problems: Use research based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

E. Modern tool usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including predictions and modeling to complex engineering activities with an understanding of the limitations.

F. The Engineer and society: Apply reasoning, informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practices.

G. Environment and sustainability: Understand the impact of the professional engineering solutions in society and environmental context and demonstrate the knowledge of and need for sustainable development.

H. Ethics: Apply ethical principles and commitment to professional ethics, responsibilities and norms of the engineering practice.

I. Individual and team work: Function effectively as an individual and as a member or leader in diverse teams and in multi-disciplinary settings.

J. Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as being able to comprehend, write effective reports, design documentation, make effective presentations, give and receive clear instructions.

K. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

L. Life – long learning: Recognize the need and have the preparation, ability to engage in independent and life – long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES:

PS01: Students acquire necessary technical skills in mechanical engineering that make them employable graduate.

PSO2: An ability to impart technological inputs towards development of society by becoming an entrepreneur.

COURSE OBJECTIVES:

1. To impart the knowledge of basic concepts on engineering process of design.
2. To illustrate basic analytical fundamentals used to create geometry models.
3. To Impart the knowledge of drafting and 3D modeling systems.
4. To provide experience in using CAD tools and develop simple projects.
5. To introduce solving of engineering problems using MATLAB.

COURSE OUTCOMES:

ME 382.1   Apply computer methods for solving wide range of engineering problems.

ME 382.2   Generate various drafting designs using computer engineering software.

ME 382.3   Understand computer engineering software to present various drafting designs.

ME 382.4   Use computer engineering software to solve and present problem solutions.

ME 382.5   Illustrate use of programming language software in basic engineering problems.

ME 382.6   Understand the use of various tools for editing and creating designs.

INSTRUCTIONS TO THE STUDENTS

1. Every student should obtain a copy of the laboratory manual
2. It is important that all students arrive at each session on time.
3. Dress code: Students must come to the laboratory wearing:
   - Trousers.
   - half-sleeve tops.
   - Leather shoes.
   - Half pants, loosely hanging garments and slippers are not allowed.
4. Students should come with thorough preparation for the experiment to be conducted.
5. Students will not be permitted to attend the laboratory unless they bring the practical record fully completed in all respects pertaining to the experiment conducted in the previous class.
6. Experiment should be started only after the staff-in-charge has checked the experimental setup.
7. All the calculations should be made in the observation book. Specimen calculations for one set of readings have to be shown in the practical record.
8. Wherever graphs are to be drawn, A-4 size graphs only should be used and the same should be firmly attached to the practical record.
9. Practical record and observation should be neatly maintained.
10. They should obtain the signature of the staff-in-charge in the observation book after completing each experiment.
11. Theory regarding each experiment should be written in the practical record before procedure in your own words.

LABORATORY SAFETY PRECAUTIONS

1. Laboratory uniform, shoes & safety glasses are compulsory in the lab.
2. Do not touch anything with which you are not completely familiar. Carelessness may not only break the valuable equipment in the lab but may also cause serious injury to you and others in the lab.
3. Please follow instructions precisely as instructed by your supervisor. Do not start the experiment unless your setup is verified & approved by your supervisor.
4. Do not leave the experiments unattended while in progress.
5. Do not crowd around the equipment's & run inside the laboratory.
6. During experiments material may fail and disperse, please wear safety glasses and maintain a safe distance from the experiment.
7. If any part of the equipment fails while being used, report it immediately to your supervisor. Never try to fix the problem yourself because you could further damage the equipment and harm yourself and others in the lab.
8. Keep the work area clear of all materials except those needed for your work and cleanup after your work.

LIST OF EXPERIMENTS

1. Drawing of a Title Block with necessary text and projection symbol.

2. Creations of various 2D drafting using CAD tools.

3. Drawing of front view and top view of simple solids and dimensioning.

4. Drawing sectional views for simple 3D designs.

5. Drawing of front view, top view and side view of objects for pictorial views.

6. Drawing isometric projection of simple objects.

7. Write MATLAB commands to analyze arithmetic, logical and Boolean operations.

8. Write MATLAB commands to analyze vector operations and magic matrixes.

9. Analyze the following operations in MATLAB.

    a) Colon operator b) Line Plotting c) 2D plotting

10. Write a MATLAB program to obtain smallest and largest values of integers.

11. Write a program to multiply 3X3 matrix and obtain inverse of the resultant matrix.

12. Write a MATLAB program to obtain smallest and largest of floating-point numbers.

1. MATLAB

General Introduction

- MATLAB is a powerful language for technical computing. The name MATLAB stands for MATrix LABoratory, because its basic data element is a matrix (array).

- MATLAB can be used for math computations, modeling and simulations, data analysis and processing, visualization and graphics, and algorithm development.

- MATLAB is widely used in universities and colleges in introductory and advanced courses in mathematics, science, and especially in engineering. In industry the software is used in research, development and design. The standard MATLAB program has tools (functions) that can be used to solve common problems.

- In addition, MATLAB has optional toolboxes that are collections of specialized programs designed to solve specific types of problems. Examples include toolboxes for signal processing, symbolic calculations, and control systems.

- Until recently, most of the users of MATLAB have been people who had previous knowledge of programming languages such as FORTRAN or C, and switched to MATLAB as the software became popular. Consequently, the majority of the literature that has been written about MATLAB assumes that the reader has knowledge of computer programming.
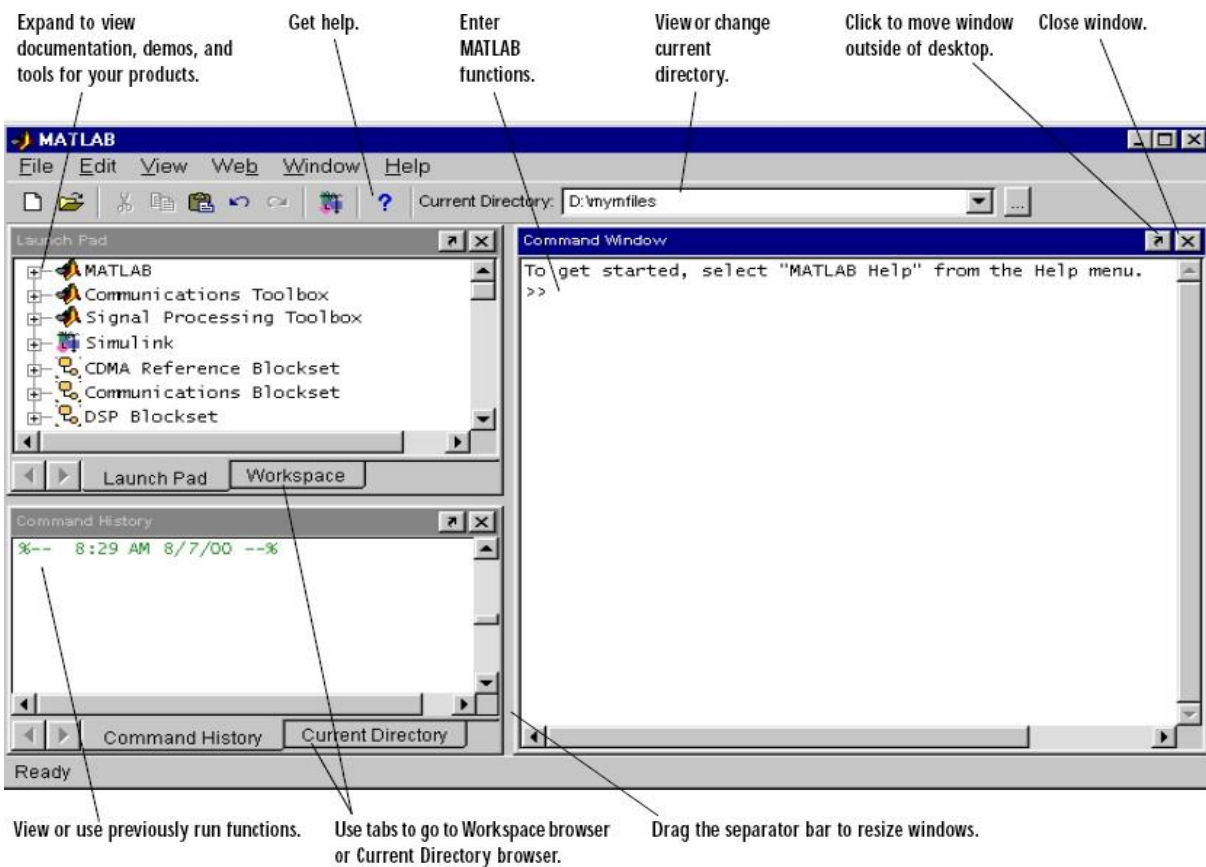
The Purpose of This Manual

This manual is intended for students who are using MATLAB for the first time and have little or no experience in computer programming.

Lab Instructions

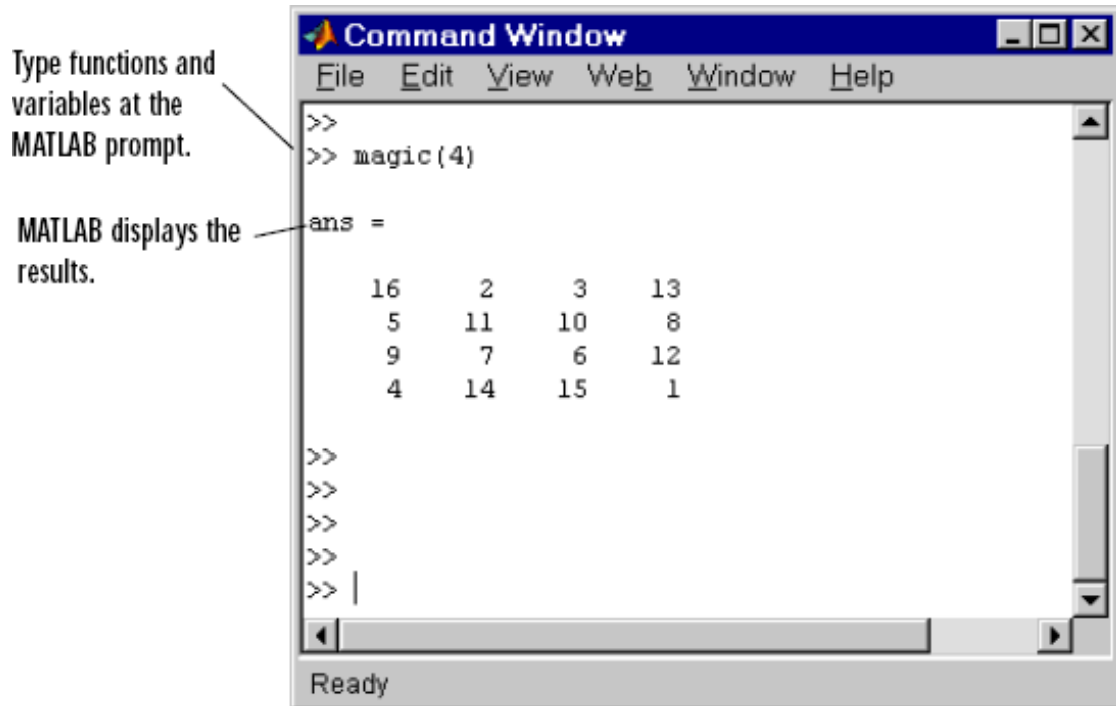**When you attend to the lab you must follow the following instructions:**

1. **Attend at your time, not before not after;**

2. **Try to use the same computer every time you attend the lab;**

3. **Open your computer and run the Matlab program;**

4. **Make a folder with your name and save the programs you perform at this folder, (this important for your evaluation).**

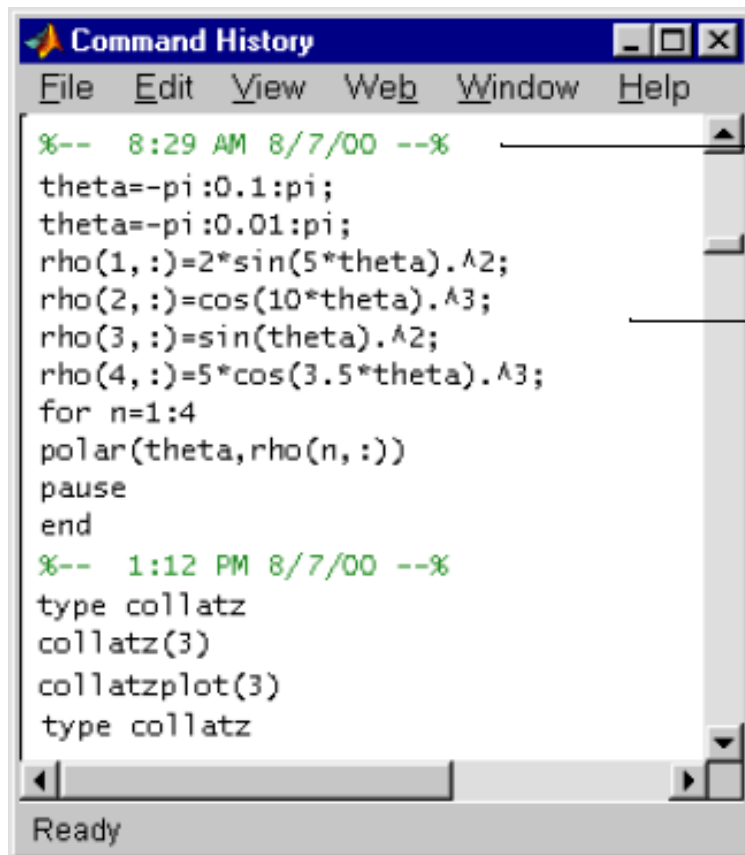# 1. Explain the main windows in matlab desktop?

Expand to view documentation, demos, and tools for your products.

Get help.

Enter MATLAB functions.

View or change current directory.

Click to move window outside of desktop.

Close window.

MATLAB

File Edit View Web Window Help

Current Directory: D:\mymfiles

Launch Pad

MATLAB
Communications Toolbox
Signal Processing Toolbox
Simulink
CDMA Reference Blockset
Communications Blockset
DSP Blockset

Launch Pad Workspace

Command History

%-- 8:29 AM 8/7/00 --%

Command History Current Directory

Ready

Command Window

To get started, select "MATLAB Help" from the Help menu.
>>

View or use previously run functions.

Use tabs to go to Workspace browser or Current Directory browser.

Drag the separator bar to resize windows.

1. <u>Command Window</u>

- **This window is used to <u>enter</u> variables and run functions and M-files.**
- **For more information, click the Help button.**

Type functions and variables at the MATLAB prompt.

MATLAB displays the results.

```
Command Window                          _ □ ×
File   Edit   View   Web   Window   Help
>>
>> magic(4)

ans =

    16     2     3    13
     5    11    10     8
     9     7     6    12
     4    14    15     1

>>
>>
>>
>>
>> |

Ready
```

2. Command History

- **In this window, we can view previously used functions, and copy and execute selected lines.**

Timestamp marks the start of each session.

Select one or more lines and right-click to copy, evaluate, or create an M-file from the selection.

3. Launch Pad

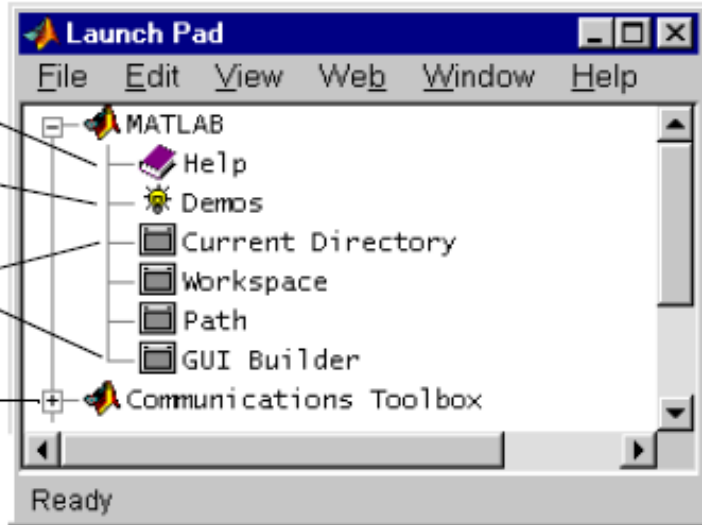- **MATLAB's Launch Pad provides easy access to tools, demos, and documentation.**

Sample of listings in Launch Pad – you'll see listings for all products installed on your system.

Help - double-click to go directly to documentation for the product.

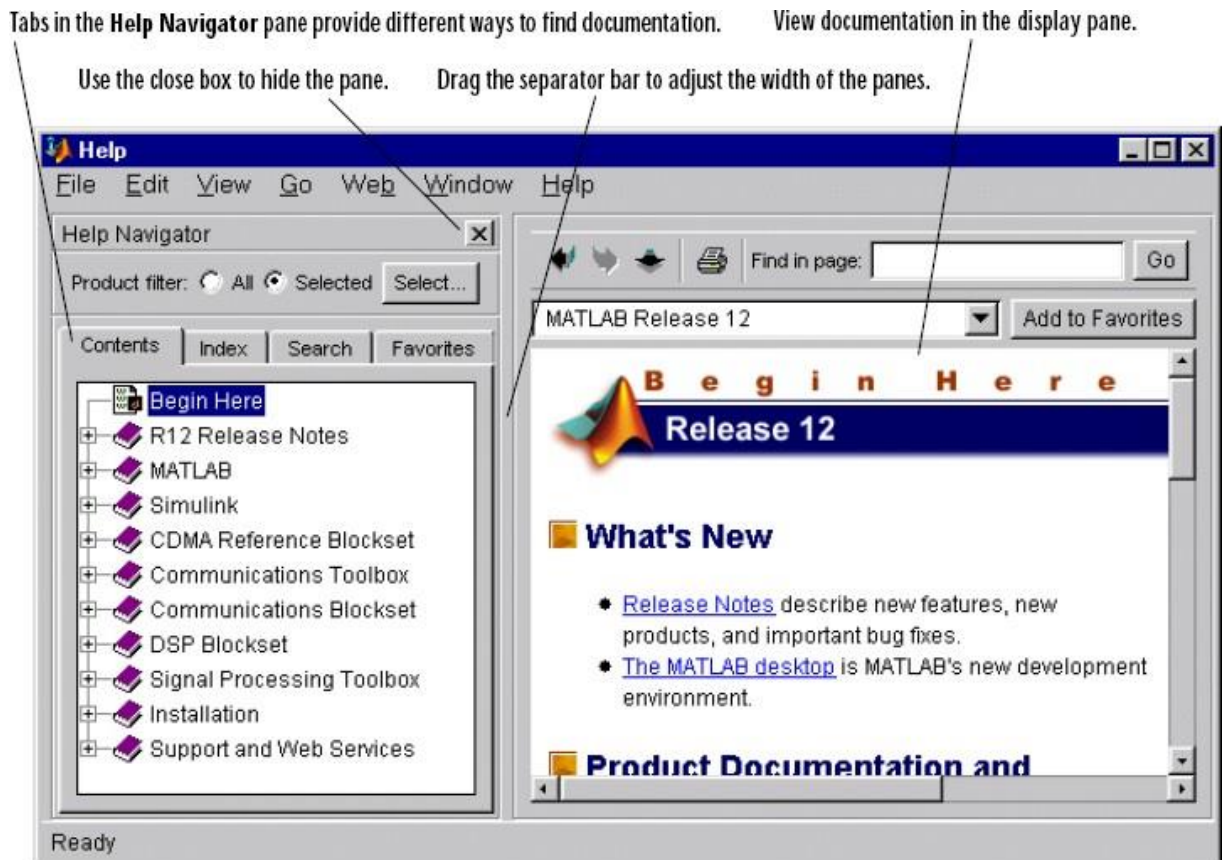**Demos** - double-click to display the demo launcher for the product.

Tools - double-click to open the tool.

Click + to show the listing for a product.

```
Launch Pad                            _ □ ✕
File   Edit   View   Web   Window   Help

⊟─ MATLAB
   ├─  Help
   ├─  Demos
   ├─  Current Directory
   ├─  Workspace
   ├─  Path
   └─  GUI Builder
⊞─  Communications Toolbox

Ready
```
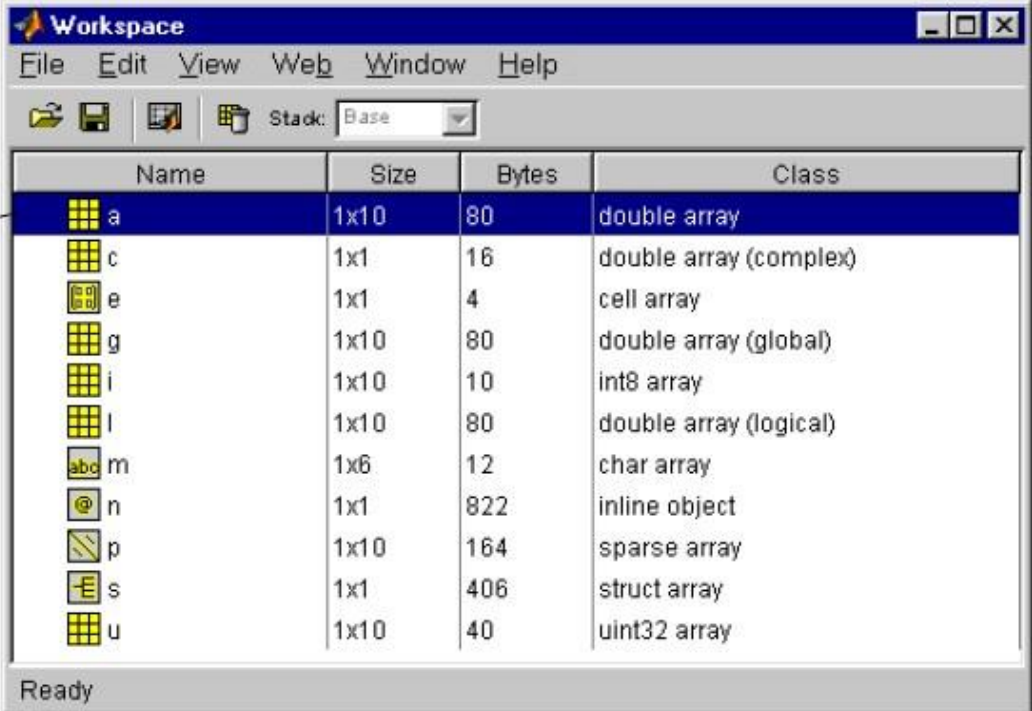
4. Help browser

- **The Help browser is used to search and view documentation for all your Math Works products.**
- **To open the Help browser, <u>click</u> the help button in the toolbar, or Type <u>helpbrowser</u> in the Command Window.**

Tabs in the **Help Navigator** pane provide different ways to find documentation.   View documentation in the display pane.

Use the close box to hide the pane.   Drag the separator bar to adjust the width of the panes.

5.MATLAB Workspace

- **The <u>MATLAB workspace</u> consists of the set of variables built up during a MATLAB session and stored in memory.**

Name	Size	Bytes	Class
a	1x10	80	double array
c	1x1	16	double array (complex)
e	1x1	4	cell array
g	1x10	80	double array (global)
i	1x10	10	int8 array
l	1x10	80	double array (logical)
m	1x6	12	char array
n	1x1	822	inline object
p	1x10	164	sparse array
s	1x1	406	struct array
u	1x10	40	uint32 array

Double-click a variable to see and change its contents in the Array Editor.

6.Current Directory Browser

- **MATLAB file operations use the current directory and the search path as reference points.**
- **Any file you want to run must either be in the current directory or on the search path.**

Use the pathname edit box to view directories and their contents

Click the find button to search for content within M-files

Double-click a file to open it in an appropriate tool.

View the help portion of the selected M-file.
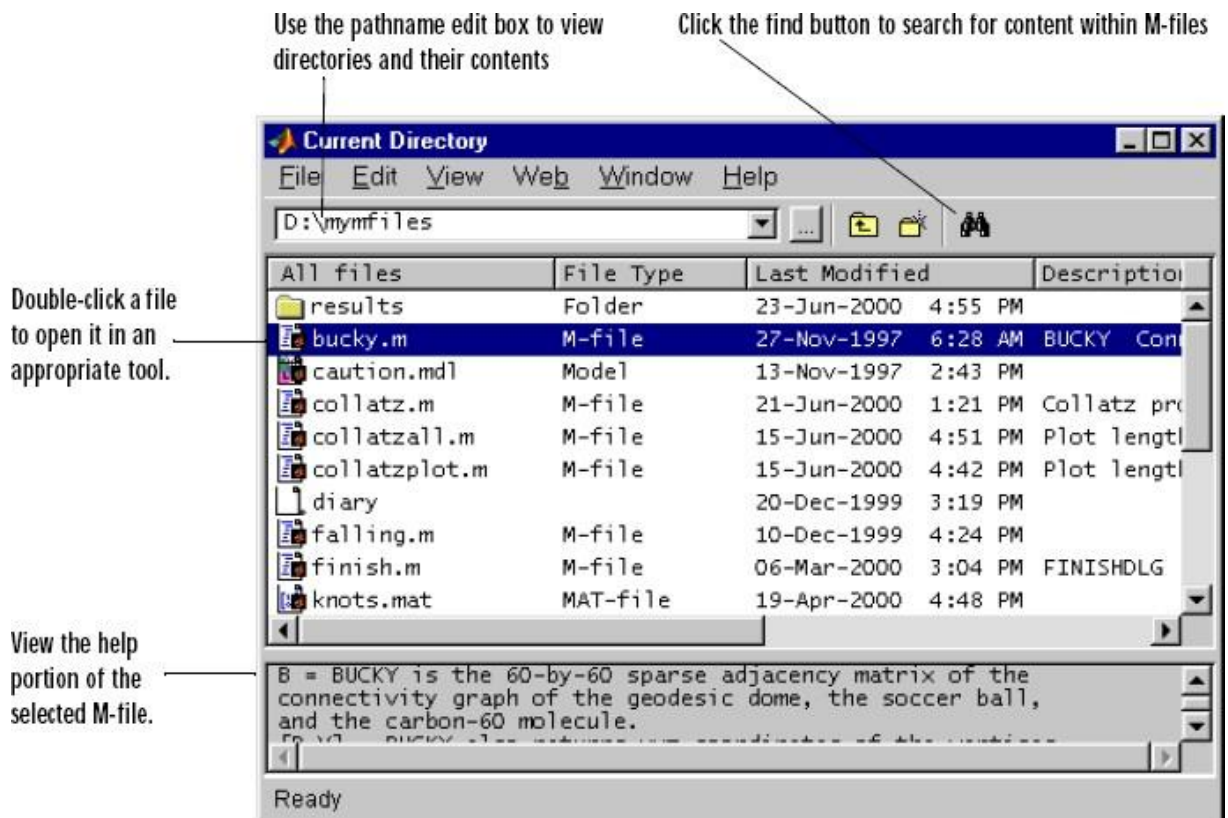
Lab 1: Introduction to MATLAB

1. Warm-up

MATLAB is a high-level programming language that has been used extensively to solve complex engineering problems. The language itself bears some similarities with ANSI C and FORTRAN.

MATLAB works with three types of windows on your computer screen. These are the `Command` window, the `Figure` window and the `Editor` window. The `Figure` window only pops up whenever you plot something. The `Editor` window is used for writing and editing MATLAB programs (called M-files) and can be invoked in Windows from the pull-down menu after selecting `File New M-file`. In UNIX, the `Editor` window pops up when you type in the command window: `edit filename` ('filename' is the name of the file you want to create).

The `command` window is the main window in which you communicate with the MATLAB interpreter. The MATLAB interpreter displays a command >> indicating that it is ready to accept commands from you.

- View the MATLAB introduction by typing

  >> `intro`

at the MATLAB prompt. This short introduction will demonstrate some basic MATLAB commands.

- Explore MATLAB's help capability by trying the following:

  >> `help`

  >> `help plot`

  >> `help ops`

  >> `help arith`

- Type `demo` and explore some of the demos of MATLAB commands.

- You can use the `command` window as a calculator, or you can use it to call other MATLAB programs (M-files).

Say you want to evaluate the expression $a^3 + \sqrt{bd} - 4c$, where a=1.2, b=2.3, c=4.5 and d=4. Then in the `command` window, type:

  >> `a = 1.2;`

  >> `b=2.3;`

  >> `c=4.5;`

  >> `d=4;`

  >> `a^3+sqrt(b*d)-4*c`

```
ans =
        -13.2388
```
Note the semicolon after each variable assignment. If you omit the semicolon, then MATLAB echoes back on the screen the variable value.

2. Arithmetic Operations

There are four different arithmetic operators:

      + addition
      − subtraction
      * multiplication
      / division (for matrices it also means inversion)

There are also three other operators that operate on an element by element basis:

      .* multiplication of two vectors, element by element
      ./ division of two vectors, element-wise
      .^ raise all the elements of a vector to a power.

Suppose that we have the vectors $x = [x_1, x_2, ..., x_n]$ and $y = [y_1, y_2, ..., y_n]$. Then

$$x.*y = [x_1y_1, x_2y_2, ..., x_ny_n]$$
$$x./y = [\frac{x_1}{y_1}, \frac{x_2}{y_2}, ..., \frac{x_n}{y_n}]$$
$$x.^p = [x_1^p, x_2^p, ..., x_n^p]$$

The arithmetic operators + and − can be used to add or subtract matrices, scalars or vectors. By vectors we mean one-dimensional arrays and by matrices we mean multi-dimensional arrays. This terminology of vectors and matrices comes from Linear Algebra.

Example:
```
>> X=[1,3,4]
>> Y=[4,5,6]
>> X+Y
ans=

    5 8 10
```

For the vectors X and Y the operator + adds the elements of the vectors, one by one, assuming that the two vectors have the same dimension. In the above example, both vectors had the dimension 1×3, i.e., one row with three columns. An error will occur if you try to add a 1×3 vector to a 3×1 vector. The same applies for matrices.

    To compute the **dot product** of two vectors (i.e. $\sum_i x_iy_i$), you can use the multiplication operator * . For the above example, it is:
```
>> X*Y'
ans =

    43
```

Note the single quote after Y. The single quote denotes the <u>transpose</u> of a matrix or a vector.

To compute an element by element multiplication of two vectors (or two arrays), you can use the .* operator:

```
>> X .* Y
ans =
     4 15 24
```

That is, X.*Y means $[1\times4, 3\times5, 4\times6]$ = [4 15 24]. The '.*' operator is used very often (and is highly recommended) because it is executed much faster compared to the code that uses `for` loops.

3. Complex numbers

MATLAB also supports complex numbers. The imaginary number is denoted with the symbol `i` or `j` , assuming that you did not use these symbols anywhere in your program (that is very important!). Try the following:

```
>> z=3 + 4i % note that you do not need the '*' after 4
>> conj(z) % computes the conjugate of z
>> angle(z) % computes the phase of z
>> real(z) % computes the real part of z
>> imag(z) % computes the imaginary part of z
>> abs(z) % computes the magnitude of z
```

You can also define the imaginary number with any other variables you like. Try the following:

```
>> img=sqrt(-1)
>> z=3+4*img
>> exp(pi*img)
```

4. Array indexing

In MATLAB, all arrays (vectors) are indexed starting with 1, i.e., y(1) is the first element of the array y. Note that the arrays are indexed using parenthesis (.) and not square brackets [.] as in C/C++. To create an array having as elements the integers 1 through 6, just enter:

```
>> x=[1,2,3,4,5,6]
```

Alternatively, you can use the : notation,

```
>> x=1:6
```

The : notation above creates a vector starting from 1 to 6, in steps of 1. If you want to create a vector from 1 to 6 in steps of say 2, then type:

```
>> x=1:2:6
Ans =
     1 3 5
```

Try the following code:

```
>> ii=2:4:17
>> jj=20:-2:0
```

```
>> ii=2:(1/10):4
```

Extracting or inserting numbers in a vector can be done very easily. To concatenate an array, you can use the [ ] operator, as shown in the example below:

```
>> x=[1:3   4 6   100:110]
```

To access a subset of the array, try the following:

```
>> x(3:7)
>> length(x) % gives the size of the array or vector
>> x(2:2:length(x))
```

5. Allocating memory

You can allocate memory for one-dimensional arrays (vectors) using the `zeros` command. The following command allocates memory for a 100-dimensional array:

```
>> Y=zeros(100,1);
>> Y(30)
ans =

        0
```

Similarly, you can allocate memory for two-dimensional arrays (matrices). The command

```
>> Y=zeros(4,5)
```

defines a 4 by 5 matrix. Similar to the `zeros` command, you can use the command `ones` to define a vector containing all ones,

```
>> Y=ones(1,5)
ans=
    1 1 1 1 1
```

6. Special characters and functions

Some common special characters used in MATLAB are given below:

Symbol	Meaning
pi	π(3.14...)
sqrt	indicates square root e.g., sqrt(4)=2
^	indicates power(e.g., 3ˆ2=9)
abs	Absolute value ∣ .∣ e.g., abs(-3)=3
NaN	Not-a-number, obtained when comparing mathematically undefined operations, such as 0/0
Inf	Represents +∞
;	Indicates the end of a row in a matrix. It is also used to suppress printing on the screen (echo off)
%	Denotes a comment. Anything to the right of % is ignored by the MATLAB interpreter and is considered as comments
'	Denotes transpose of a vector or matrix. It's also used to define strings, e.g.,str1='DSP';

Some special functions are given below:

`length(x)` - gives the dimension of the array x

`find` - Finds indices of nonzero elements.

Examples :

```
>> x=1:10;
>> length(x)
ans =
      10
```

The function `find` returns the indices of the vector X that are non-zero. For example, I = `find(X>100)`, finds all the indices of X when X is greater than 100. So for the above example:

```
>> find(x > 4)
ans =
    5 6 7 8 9 10
```

7. Control flow

MATLAB has the following flow control constructs:

· if statements

· switch statements

· for loops

· while loops

· break statements

The if, for, switch and while statements need to terminate with an end statement.
Examples:

IF:

```
x=-3;
if x>0
    str='positive';
elseif x<0
    str='negative';
elseif x= = 0
    str='zero';
else
    str='error ';
end
```

What is the value of 'str' after execution of the above code?

WHILE:
```
x=-10;
while x<0
    x=x+1;
end
```

What is the value of x after execution of the above loop?

FOR loop:
```
X=0;
for i=1:10
    X=X+1;
end
```
The above code computes the sum of all numbers from 1 to 10.

BREAK:
The break statement lets you exit early from a for or a while loop:
```
x=-10;
while x<0
    x=x+2;
    if x = = -2
        break;
    end
end
```

MATLAB supports the following relational and logical operators:
    Relational Operators

```
Symbol   Meaning
  <=     Less than equal
  <      Less than
  >=     Greater than equal
  >      Greater than
  ==     Equal
  ˜=     Not equal
```

Logical Operators
```
Symbol   Meaning
  &      AND
  |      OR
  ˜      NOT
```

8. Plotting

You can plot arrays using MATLAB's function plot. The function plot (.) is used to generate line plots. The function stem (.) is used to generate "picket-fence" type of plots. Example:

```
>> x=1:20;
>> plot (x)    % see Figure 1
>> stem (x)    % see Figure 2
```
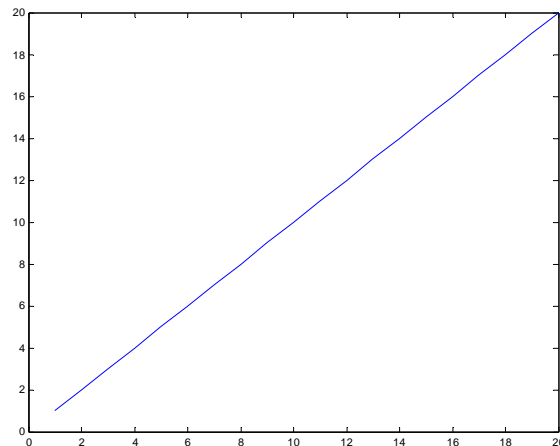

Figure 1: Plot obtained using the plot command.

Example of a plot generated using the plot command is shown in Figure 1, and example of a plot generated using the stem function is shown in Figure 2. More generally, plot(X, Y) plots vector Y versus vector X. Various line types, plot symbols and colors may be obtained
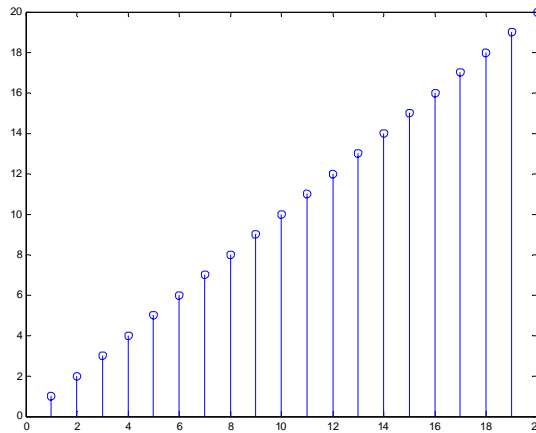
Figure 2: Plot obtained using the `stem` function.

using `plot( X, Y, S)` where S is a character string indicating the color of the line, and the type of line (e.g., dashed, solid, dotted, etc.). Examples for the string S include:

r	red	+	plus	--	dashed
g	green	*	star		
b	blue	s	square		

You can insert x-labels, y-labels and title to the plots, using the functions `xl abe l (.)`, `ylabe l(.)` and `t i t le(.)` respectively. To plot two or more graphs on the same figure, use the command `subp lot`. For instance, to show the above two plots in the same figure,type:
```
>> subp lot (2 ,1 ,1), plot( x)
>> subp lot (2 ,1 ,2), stem( x)
```
   The (m,n,p) argument in the subplot command indicates that the figure will be split in m rows and n columns. The 'p' argument takes the values 1, 2, . . . , $m \times n$. In the example above, $m = 2, n = 1$,and, $p = 1$ for the top figure and $p = 2$ for the bottom figure.

   To get more help on plotting, type: `help  plot` or `help  subplo t`.

9. Programming in M ATLA B (M- files)

MATLAB programming is done using M-files, i.e., files that have the extension .m. These files are created using a text editor. To open the text editor, go to the `File` pull-down menu, choose `New`, then `M-f i le`. After you type in the program, save it, and then call it from the command window to execute it.
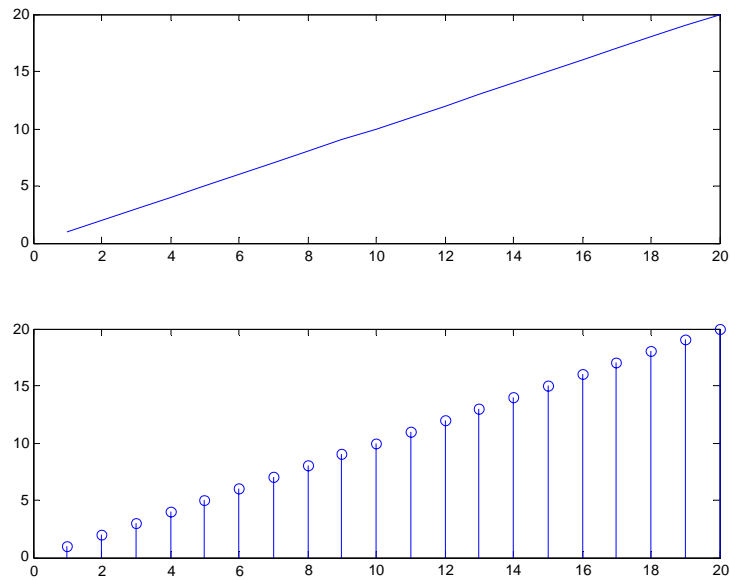
Figure 3: Output of the subplot(2,1,p) command.

Say for instance that you want to write a program to compute the average (mean) of a vector x. The program should take as input the vector x and return the average of the vector.

Steps:

1. You need to create a new file, called "average.m". If you are in Windows, open the text editor by going to the File pull-down menu, choose New, then M-file. If you are in UNIX, then type in the command window: edit average.m. Type the following in the empty file

```
function y=average(x)
L=length(x);
sum=0 ;
for i=1:L
    sum=sum+x(i);
end
y=sum/L; % the average of x
```

Remarks:
  y — is the output of the function "average"
  x — is the input array to the function "average"

average — is the name of the function. It's best if it has the same name as the filename. MATLAB files always need to have the extension .m

2. From the Editor pull-down menu, go to File | Save, and enter: `average.m` for the filename.

3. Go to the Command window to execute the program by typing:

```
>> x=1:100;
>> y=average(x)
ans =
        50.5000
```

Note that the function `average` takes as input the array `x` and returns one number, the average of the array. In general, you can pass more than one input argument and can have the function return multiple values. You can declare the function `average`, for instance, to return 3 variables while taking 4 variables as input with the following statement:

```
function [y1, y2, y3]=average(x1,x2,x3,x4)
```

In the command window it has to be invoked as:

```
>> [y1, y2, y3]=average(x1,x2,x3,x4)
```

10. MATLA B sound

If your PC has a sound card, then you can use the function `soundsc` to play back speech or audio files through the PC's speakers. The usage of this function is given below:

`soundsc(Y,FS)` sends the signal in vector Y (with sample frequency FS) out to the speaker on platforms that support sound. Stereo sounds are played, on platforms that support it, when Y is an N-by-2 matrix.

Try the following code, and listen to a 400-Hz tone:
```
>> t=0:1/8192:1;
>>  x=cos(2*pi*400*t);
>> soundsc(x,8192);
```

Now, try listening to noise:
```
>>  noise=randn(8192,1);    % generate 8192 samples of noise
>> soundsc(noise,8192);
```
The function `randn` generates Gaussian noise.

11. Loading and saving data

You can load or save data using the commands `load` and `save`. To save the variable `x` of the above code in the file `data.mat`, type:

>> save data.mat x

Note that MATLAB's data files have the extension `.mat`. To retrieve the data that was saved in the vector `x`, type:

>> load data.mat

The vector x is loaded in memory. To see the contents of memory use the command `whos`:

>> whos

```
Name      Size      Bytes     Class
x         1x8193    65544     double array
Grand total is 8193 elements using 65544 bytes
```

The command `whos` gives a list of all the variables currently in memory, along with their dimension. In our case, `x` contained 8193 samples.

To clear up memory after loading a file, you may type `clear all` when done. That is `very important`, because if you do not clear all the variables in memory, you may run into problems with other programs that you will write that use the same variables.

MATLAB Function Reference

This is a summary of the Matlab built-in commands or functions. The list is not complete.
For a detailed explanation and examples of each function you can type 'help **function**' (without quotes) in your Matlab command window.

Command Window and History

clc	Clear Command Window
diary	Save session to file
dos	Execute DOS command and return result
format	Control display format for output
home	Move cursor to upper left corner of Command Window
more	Control paged output for Command Window
system	Execute operating system command and return result

Help for Using MATLAB

demo	Access product demos via Help browser
docsearch	Open Help browser Search pane and run search for specified term
help	Display help for MATLAB functions in Command Window
helpbrowser	Display Help browser for access to full online documentation and demos
helpwin	Provide access to and display M-file help for all functions
lookfor	Search for specified keyword in all help entries

Workspace

clear	Remove items from workspace, freeing up system memory
evalin	Execute string containing MATLAB expression in a workspace
exist	Check if variables or functions are defined
which	Locate functions and files
who, whos	List variables in workspace
workspace	Display Workspace browser, a tool for managing workspace

File Operations, Shutdown

cd	Change working directory
copyfile	Copy file or directory
delete	Delete files or graphics objects
dir	Display directory listing
exist	Check if variables or functions are defined
mkdir	Make new directory
movefile	Move file or directory
pwd	Display current directory
rmdir	Remove directory
type	List file
exit	Terminate MATLAB (same as quit)
genpath	Generate a path string
quit	Terminate MATLAB

Editing and Debugging

dbclear	Clear breakpoints
dbcont	Resume execution
dbdown	Change local workspace context
dbquit	Quit debug mode
dbstatus	List all breakpoints
dbstep	Execute one or more lines from current breakpoint
dbstop	Set breakpoints
dbtype	List M-file with line numbers
debug	M-file debugging functions
edit	Edit or create M-file

System

computer	Identify information about computer on which MATLAB is running
usejava	Determine if a Java feature is supported in MATLAB
ver	Display version information for MathWorks products
version	Get MATLAB version number

Basic Information

disp	Display array
display	Display array
isempty	True for empty matrix
isequal	True if arrays are identical
isfloat	True for floating-point arrays
isinteger	True for integer arrays
islogical	True for logical array
isnumeric	True for numeric arrays
isscalar	True for scalars
issparse	True for sparse matrix
isvector	True for vectors
length	Length of vector
ndims	Number of dimensions
numel	Number of elements
size	Size of matrix

Operators

+	Addition, Unary plus
-	Subtraction, Unary minus
*	Matrix multiplication
^	Matrix power
\	Backslash or left matrix divide
/	Slash or right matrix divide
'	Transpose
.'	Nonconjugated transpose
.*	Array multiplication (element-wise)
.^	Array power (element-wise)
.\	Left array divide (element-wise)
./	Right array divide (element-wise)

Operations and Manipulation

:	Index into array, rearrange array
cat	Concatenate arrays
cross	Vector cross product
cumprod	Cumulative product
cumsum	Cumulative sum
diag	Diagonal matrices and diagonals of matrix
dot	Vector dot product
end	Last index
find	Find indices of nonzero elements
fliplr	Flip matrices left-right
flipud	Flip matrices up-down
horzcat	Horizontal concatenation
max	Maximum value of array
min	Minimum value of array
prod	Product of array elements
rot90	Rotate matrix 90 degrees
sort	Sort array elements in ascending or descending order
sortrows	Sort rows in ascending order
sum	Sum of array elements
tril	Lower triangular part of matrix
triu	Upper triangular part of matrix
vertcat	Vertical concatenation

Linear Equations

\ and /	Linear equation solution
chol	Cholesky factorization
cholinc	Incomplete Cholesky factorization
inv	Matrix inverse
linsolve	Solve linear systems of equations
lu	LU matrix factorization
luinc	Incomplete LU factorization
pinv	Moore-Penrose pseudoinverse of matrix
qr	Orthogonal-triangular decomposition

Exponential

exp	Exponential
log	Natural logarithm
log2	Base 2 logarithm and dissect floating-point numbers into exponent and mantissa
log10	Common logarithm (base 10)
pow2	Base 2 power and scale floating-point number
reallog	Natural logarithm for nonnegative real arrays
realsqrt	Square root for nonnegative real arrays
sqrt	Square root
nthroot	Real nth root

Complex

abs	Absolute value
angle	Phase angle
conj	Complex conjugate
i, j	Imaginary unit
imag	Complex imaginary part
isreal	True for real array
real	Complex real part
sign	Signum

Rounding and Remainder

fix	Round towards zero
floor	Round towards minus infinity
ceil	Round towards plus infinity
round	Round towards nearest integer
mod	Modulus after division
rem	Remainder after division

Discrete Math

factor	Prime factors
factorial	Factorial function
gcd	Greatest common divisor
isprime	True for prime numbers
lcm	Least common multiple
nchoosek	All combinations of N elements taken K at a time
perms	All possible permutations
primes	Generate list of prime numbers
rat, rats	Rational fraction approximation

Basic Operations

max	Maximum elements of array
mean	Average or mean value of arrays
median	Median value of arrays
min	Minimum elements of array
prod	Product of array elements
std	Standard deviation
var	Variance

Polynomials

conv	Convolution and polynomial multiplication
deconv	Deconvolution and polynomial division
poly	Polynomial with specified roots
polyder	Polynomial derivative
polyeig	Polynomial eigenvalue problem
polyfit	Polynomial curve fitting
polyint	Analytic polynomial integration
polyval	Polynomial evaluation
polyvalm	Matrix polynomial evaluation
residue	Convert between partial fraction expansion and polynomial coefficients
roots	Polynomial roots

Math Constants

eps	Floating-point relative accuracy
i, j	Imaginary unit
Inf	Infinity,
intmax	Largest possible value of specified integer type
intmin	Smallest possible value of specified integer type
NaN	Not-a-Number
pi	Ratio of a circle's circumference to its diameter,
realmax	Largest positive floating-point number
realmin	Smallest positive floating-point number

Basic Array Information

disp	Display text or array
display	Overloaded method to display text or array
isempty	Determine if array is empty
isequal	Determine if arrays are numerically equal
islogical	Determine if item is logical array
isnumeric	Determine if item is numeric array
isscalar	Determine if item is a scalar
isvector	Determine if item is a vector
length	Length of vector
ndims	Number of array dimensions
numel	Number of elements in matrix or cell array
size	Array dimensions

Cell Arrays

{ }	Construct cell array
cell	Construct cell array
cellfun	Apply function to each element in cell array
cellstr	Create cell array of strings from character array
cell2mat	Convert cell array of matrices into single matrix
cell2struct	Cell array to structure array conversion
celldisp	Display cell array contents
cellplot	Graphically display structure of cell arrays
iscell	Determine if item is cell array
iscellstr	Determine if item is cell array of strings
isequal	Determine if arrays are numerically equal
mat2cell	Divide matrix up into cell array of matrices
num2cell	Convert numeric array into cell array
struct2cell	Structure to cell array conversion

Numeric

[ ]	Array constructor
cat	Concatenate arrays
find	Find indices and values of nonzero array elements
intmax	Largest possible value of specified integer type
intmin	Smallest possible value of specified integer type
intwarning	Enable or disable integer warnings
isa	Determine if item is object of given class (e.g., numeric)
isequal	Determine if arrays are numerically equal
isnumeric	Determine if item is numeric array
isreal	Determine if all array elements are real numbers
isscalar	True for scalars (1-by-1 matrices)
isvector	True for vectors (1-by-N or N-by-1 matrices)
permute	Rearrange dimensions of multidimensional array
realmax	Largest positive floating-point number
realmin	Smallest positive floating-point number
zeros	Create array of all zeros

Creating and Manipulating Strings

blanks	Create string of blanks
char	Create character array (string)
cellstr	Create cell array of strings from character array
deblank	Strip trailing blanks from the end of string
lower	Convert string to lower case
sprintf	Write formatted data to string
sscanf	Read string under format control
strcat	String concatenation
strjust	Justify character array
strread	Read formatted data from string
strrep	String search and replace
strtrim	Remove leading and trailing whitespace from string
strvcat	Vertical concatenation of strings
upper	Convert string to upper case

Elementary Arrays

eye	Identity matrix
linspace	Generate linearly spaced vectors
logspace	Generate logarithmically spaced vectors
meshgrid	Generate X and Y matrices for three-dimensional plots
ndgrid	Generate arrays for multidimensional functions and interpolation
ones	Create array of all ones
rand	Uniformly distributed random numbers and arrays
randn	Normally distributed random numbers and arrays
zeros	Create array of all zeros

Special Characters

:	Specify range of array elements
( )	Pass function arguments, or prioritize operations
[ ]	Construct array
{ }	Construct cell array
.	Decimal point, or structure field separator
...	Continue statement to next line
,	Array row element separator
;	Array column element separator
%	Insert comment line into code
!	Command to operating system
=	Assignment

Relational Operations

<	Less than
<=	Less than or equal to
>	Greater than
>=	Greater than or equal to
==	Equal to
~=	Not equal to

Logical Operations

&&	Logical AND
||	Logical OR
&	Logical AND for arrays
|	Logical OR for arrays
~	Logical NOT
all	Test to determine if all elements are nonzero
any	Test for any nonzero elements
iskeyword	Determine if string is MATLAB keyword
isvarname	Determine if string is valid variable name
logical	Convert numeric values to logical
true	True array
xor	Logical EXCLUSIVE OR

EXERCISES

AIM: - To write a MATLAB program to perform some basic operation on matrices such as addition, subtraction, multiplication.

SOFTWARE REQURIED:-

      MATLAB R2006).

PROCEDURE:-

1. Open MATLAB
2. Open new M-file
3. Type the program
4. Save in current directory
5. Compile and Run the program
6. For the output see command window\ Figure window

RESULT:-   When you run the file addition, subtraction, multiplication in Matlab result will be displayed.

SOLUTION :-

```
>> A = [1 0 1; 2 3 4; -1 6 7]
A =
    1    0    1
    2    3    4
   -1    6    7

>> B = [7 4 2; 3 5 6; -1 2 1]
B =
    7    4    2
    3    5    6
   -1    2    1
```

(*a*)
```
>> C = A + B
C =
    8    4    3
    5    8   10
   -2    8    8
```

(*b*)
```
>> D = A*B
D =
    6    6    3
   19   31   26
    4   40   41
```

(*c*)
```
>> E = A^2 = A²
E =
    0    6    8
    4   33   42
    4   60   72
```

AIM: Write a MATLAB program to determine the values of x, y and z for the following set of linear algebraic equations:

$$x_2 - 3x_3 = -5$$
$$2x_1 + 3x_2 - x_3 = 7$$
$$4x_1 + 5x_2 - 2x_3 = 10$$

SOFTWARE REQURIED:-

     MATLAB R2005 (7.3 Version).

PROCEDURE:-
- Open MATLAB
- Open new M-file
- Type the program
- Save in current directory
- Compile and Run the program
- For the output see command window\ Figure window

RESULT:-
     When you run the matlab, result will be displayed..

SOLUTION

$$\mathbf{A} = \begin{bmatrix} 0 & 1 & -3 \\ 2 & 3 & -1 \\ 4 & 5 & -2 \end{bmatrix}, \quad \mathbf{B} = \begin{bmatrix} 5 \\ 7 \\ 10 \end{bmatrix} \text{ and } \mathbf{X} = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

AX = B

A⁻¹AX = A⁻¹B

IX = A⁻¹B

or   **X = A⁻¹B**

```
>> A = [0 1 -3; 2 3 -1; 4 5 -2];
>> B = [-5; 7; 10]
>> x = inv (A)*B
   x =
        -1.0000
         4.0000
         3.0000
>> check = A*x
check =
        -5
         7
        10
```

% Alternative method

```
>> x = A\B
   x =
       -1
        4
        3
```

AIM: - To write a MATLAB program to plot using the following statements

      y1 $= 2 \cos(x)$,   y2 $= \cos(x)$, and
      y3 $= 0.5 * \cos(x)$, in the interval $0 \le x \le 2\pi$.

SOFTWARE REQURIED:-

    MATLAB R2005 (7.3 Version).

PROCEDURE:-
- Open MATLAB
- Open new M-file
- Type the program
- Save in current directory
- Compile and Run the program
- For the output see command window\ Figure window

RESULT:-
    When you run the matlab the plot was displayed.
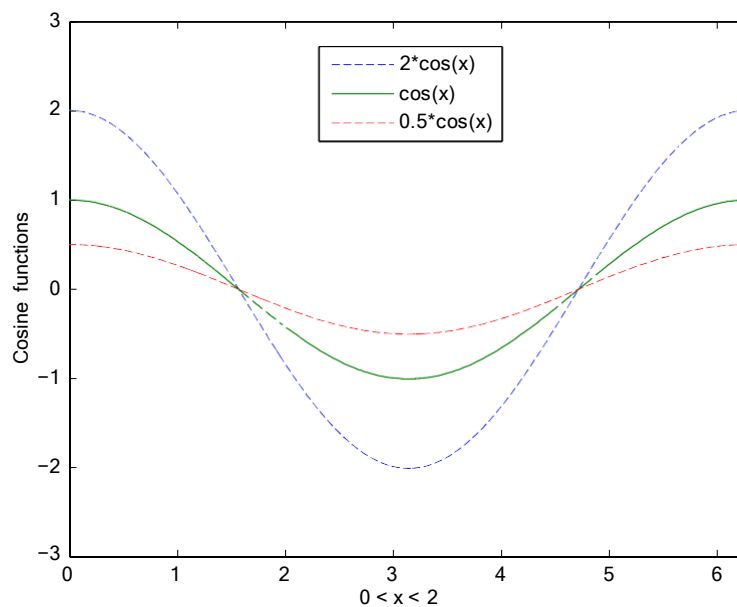
```
>> x = 0:pi/100:2*pi;
>> y1 = 2*cos(x);
>> y2 = cos(x);
>> y3 = 0.5*cos(x);
>>    plot(x,y1,'--',x,y2,'-',x,y3,':')
>> xlabel('0 \leq x \leq 2\pi')
>> ylabel('Cosine  functions')
>>    legend('2*cos(x)','cos(x)','0.5*cos(x)')
```

Attributes for plotSYMBOL COLOR

SYMBOL		LINE STYLE		SYMBOL MARKER	
k	Black	—	Solid	+	Plus sign
r	Red	——	Dashed	o	Circle
b	Blue	:	Dotted	*	Asterisk
g	Green	—.	Dash-dot	.	Point
c	Cyan	none	No line	×	Cross
m	Magenta			s	Square
y	Yellow			d	Diamond

AIM: - To write a MATLAB program to demonstrate if and else if statement and to display all the prime numbers from 1 to 100.

SOFTWARE REQURIED:-

MATLAB R2005 (7.3 Version).

PROCEDURE:-
- Open MATLAB
- Open new M-file
- Type the program
- Save in current directory
- Compile and Run the program
- For the output see command window\ Figure window

RESULT:-
When you run the matlab prime numbers was successfully displayed.

```
for i=2:100

    for j=2:100

     if(~mod(i,j))

         break; % if factor found, not prime

      end

    end

    if(j > (i/j))

        fprintf('%d is prime\n', i);

    end

end
```

When you run the file, it displays the following result:

```
2 is prime

3 is prime

5 is prime

7 is prime
```

```
11 is prime

13 is prime

17 is prime

19 is prime

23 is prime

29 is prime

31 is prime

37 is prime

41 is prime

43 is prime

47 is prime

53 is prime

59 is prime

61 is prime

67 is prime

71 is prime

73 is prime

79 is prime

83 is prime

89 is prime

97 is prime
```

AIM: - To write a MATLAB program to obtain the smallest and largest values of integers

SOFTWARE REQURIED:-

MATLAB R2005 (7.3 Version).

PROCEDURE:-
- Open MATLAB
- Open new M-file
- Type the program
- Save in current directory
- Compile and Run the program
- For the output see command window\ Figure window

RESULT:-
When you run the matlab Smallest and largest values was successfully displayed.

Operator	Description
<	Less than
<=	Less than or equal to
>	Greater than
>=	Greater than or equal to
==	Equal to
~=	Not equal to

SOLUTION

```
a = 100;

b = 200;

if (a >= b)

max = a

else

max = b

end
```

When you run the file, it produces following result:

```
max =

    200
```

AIM: - To write a MATLAB program to to obtain the smallest and largest floating point numbers.

SOFTWARE REQURIED:-

MATLAB R2005 (7.3 Version).

PROCEDURE:-
- Open MATLAB
- Open new M-file
- Type the program
- Save in current directory
- Compile and Run the program
- For the output see command window\ Figure window

RESULT:-
When you run the file result is displayed.

SOLUTION

```
% displaying the smallest and largest single-precision

% floating point number

str = 'The range for single is:\n\t%g to %g and\n\t %g to  %g';

sprintf(str, -realmax('single'), -realmin('single'), ...

    realmin('single'), realmax('single'))

% displaying the smallest and largest double-precision

% floating point number
```

```
str = 'The range for double is:\n\t%g to %g and\n\t %g to  %g';

sprintf(str, -realmax('double'), -realmin('double'), ...

    realmin('double'), realmax('double'))
```

When you run the file, it displays the following result:

```
ans =

The range for single is:

     -3.40282e+38 to -1.17549e-38 and

      1.17549e-38 to  3.40282e+38

ans =

The range for double is:

     -1.79769e+308 to -2.22507e-308 and

      2.22507e-308 to  1.79769e+308
```

AIM: - To write a MATLAB program to perform following vector operations
.   Addition and Subtraction of Vectors
            Scalar Multiplication of Vectors
            Transpose of a Vector
            Vector Dot Product
            Vectors with Uniformly Spaced Elements
            Row and column vectors

SOFTWARE REQURIED:-

MATLAB R2005 (7.3 Version).

PROCEDURE:-
- Open MATLAB
- Open new M-file
- Type the program
- Save in current directory
- Compile and Run the program
- For the output see command window\ Figure window

RESULT:-
Matlab executed above vector operations and displayed.

You can add or subtract two vectors. Both the operand vectors must be of same type and have same number of elements.

```
A = [7, 11, 15, 23, 9];

B = [2, 5, 13, 16, 20];

C = A + B;

D = A - B;
```

```
 disp(C);
disp(D);
```

When you run the file, it displays the following result:

```
9    16    28    39    29

5    6    2    7    -11
```

When you multiply a vector by a number, this is called the **scalar multiplication**. Scalar multiplication produces a new vector of same type with each element of the original vector multiplied by the number.

```
v = [ 12 34 10 8];

m = 5 * v
```

When you run the file, it displays the following result:

```
m =

   60   170   50   40
```

Please note that you can perform all scalar operations on vectors. For example, you can add, subtract and divide a vector with a scalar quantity.

The transpose operation changes a column vector into a row vector and vice versa. The transpose operation is represented by a single quote (').

Create a script file with the following code:

```
r = [ 1 2 3 4 ];

tr = r';
```

```
v = [1;2;3;4];

tv = v';

disp(tr); disp(tv);
```

When you run the file, it displays the following result:

```
   1

   2

   3

   4


   1    2    3    4
```

Dot product of two vectors a = (a1, a2, ..., an) and b = (b1, b2, ..., bn) is given by:

a.b = Σ(ai.bi)

Dot product of two vectors a and b is calculated using the **dot** function.

```
dot(a, b);
```

Create a script file with the following code:

```
v1 = [2 3 4];

v2 = [1 2 3];

dp = dot(v1, v2);

disp('Dot Product:'); disp(dp);
```

When you run the file, it displays the following result:

```
Dot Product:

   20
```

MATLAB allows you to create a vector with uniformly spaced elements.

To create a vector v with the first element f, last element l, and the difference between elements is any real number n, we write:

```
v = [f : n : l]
```

Create a script file with the following code:

```
v = [1: 2: 20];

sqv = v.^2;

disp(v);disp(sqv);
```

When you run the file, it displays the following result:

```
1    3    5    7    9    11    13    15    17    19

1    9    25    49    81    121    169    225    289    361
```

AIM: - To write a MATLAB program to create row vectors, increments, and specify for Iterations using colon operator.

SOFTWARE REQURIED:-

MATLAB R2005 (7.3 Version).

PROCEDURE:-
- Open MATLAB
- Open new M-file
- Type the program
- Save in current directory
- Compile and Run the program
- For the output see command window\ Figure window

RESULT:-
Matlab executed above colon operator operations and displayed.

If you want to create a row vector, containing integers from 1 to 10, you write:

```
1:10
```

MATLAB executes the statement and returns a row vector containing the integers from 1 to 10:

```
ans =

    1    2    3    4    5    6    7    8    9    10
```

If you want to specify an increment value other than one, for example:

```
100: -5: 50
```

MATLAB executes the statement and returns the following result:

```
ans =

  100    95    90    85    80    75    70    65    60    55    50
```

Let us take another example:

```
0:pi/8:pi
```

MATLAB executes the statement and returns the following result:

```
ans =

  Columns 1 through 7

       0    0.3927    0.7854    1.1781    1.5708    1.9635    2.3562

  Columns 8 through 9

    2.7489    3.1416
```

AIM: - To write a MATLAB program using special arrays like
Magic square, rand, zeros and ones

SOFTWARE REQURIED:-

MATLAB R2005 (7.3 Version).

PROCEDURE:-
- Open MATLAB
- Open new M-file
- Type the program
- Save in current directory
- Compile and Run the program
- For the output see command window\ Figure window

RESULT:-
Matlab executed above special array operations and displayed.

The **zeros()** function creates an array of all zeros:

```
zeros(5)
```

MATLAB will execute the above statement and return the following result:

```
ans =

    0    0    0    0    0

    0    0    0    0    0

    0    0    0    0    0

    0    0    0    0    0

    0    0    0    0    0
```

The **ones()** function creates an array of all ones:

```
ones(4,3)
```

MATLAB will execute the above statement and return the following result:

```
ans =

    1    1    1

    1    1    1

    1    1    1

    1    1    1
```

The **eye()** function creates an identity matrix.

```
eye(4)
```

MATLAB will execute the above statement and return the following result:

```
ans =

   1   0   0   0

   0   1   0   0

   0   0   1   0

   0   0   0   1
```

The **rand()** function creates an array of uniformly distributed random numbers on (0,1):

```
rand(3, 5)
```

MATLAB will execute the above statement and return the following result:

```
ans =

   0.8147   0.9134   0.2785   0.9649   0.9572

   0.9058   0.6324   0.5469   0.1576   0.4854

   0.1270   0.0975   0.9575   0.9706   0.8003
```

The **magic()** function creates a magic square array. It takes a singular argument that gives the size of the square. The argument must be a scalar greater than or equal to 3.

```
magic(4)
```

MATLAB will execute the above statement and return the following result:

```
ans =

   16    2    3   13

    5   11   10    8

    9    7    6   12

    4   14   15    1
```

MATLAB Interview Questions And Answers Guide.

Question - 1:

What is MEX in MATLAB?

Ans:

They are basically native C or C++ files which are linked directly into the MatLab application at runtime. MEX files have efficiency to crash the MatLab application

Question - 2:

Do you know what is Get and Set in Matlab?

Ans:

Get and Set are referred as getter and setter functions. For assigning properties, setter functions are used while for accessing properties getter functions are used.

Question - 3:

What common toolboxes present in Matlab?

Ans:

Some of the common toolboxes in Matlab are
* Control System
* Fuzzy Logic
* Image Processing
* LMI control
* Neural Networks
* Robust Control
* System Identification

Question - 4:

What are M-file?

Ans:

They are just a plain ASCII text that is interpreted at run time. They are like sub-programs stored in text files with .m extensions and are called M-files. For most of the MatLab, development M-files are used.

Question - 5:

What graphic system used in MatLab?

Ans:

Graphic system used in MatLab is known as handle graphics. It has a high level and low-level commands.
* High Level Commands: High level command performs image processing, data visualization and animation for 2D and 3D presentation graphics
* Low Level Commands: Full customization of the appearance of graphics and building of complete graphical user interface

Question - 6:

What are Xmath features?

Ans:

* Scripting language with OOP features
* Libraries that are LNX and C language compatible
* A debugging tools with GUI features
* Color graphics can be pointed and clickable

Question - 7:

Do you know what are the four basic functions to solve Ordinary Differential Equations?

Ans:

The four basic functions that MatLab has to solve ODE's are
* Quad
* Quad8
* ODE23
* ODE45

Question - 8:

Do you know what is Simulink?

Ans:

Simulink is an add-on product to MatLab, it provides an interactive, simulating, graphical environment for modeling and analyzing of dynamic systems.

Question - 9:

What are the operators that MatLab allows?

Ans:

Matlab allows following Operators
* Arithmetic Operators
* Relational Operators
* Logical Operators
* Bitwise Operations
* Set Operations

Question - 10:

Do you know what are the types of loops does Matlab provides?

Ans:

Matlab provides loops like
* While Loop
* For Loop
* Nested Loops

Question - 11:

Do you know MatLab consist of what?

Ans:

MatLab consists of five main parts
* MatLab Language
* MatLab working environment
* Handle Graphics
* MatLab function library
* MatLab Application Program Interface (API)

Question - 12:

What is Xmath?

Ans:

Xmath is an interactive scripting and graphics environment for Xwindow workstations.
* With its significant improvement features on MATLAB-type software, interactive mathematics, scripting functionalities are elaborated.
* Following are the Xmath features:
* Sripting languages with OOP features.
* Libraries that are LNX and C language compatible.
* A debugging tools with GUI features.
* Color graphics can be pointed and clickable.
* A special layer is available that is programmable for MOTIF GUI.

Question - 13:

What is image arithmetic functions in MATLAB?

Ans:

Following is the list of image arithmetic functions and their usage.

* Imabsdiff - Returns absolute difference of two images.
* Imadd - Performs addition of two images or addition of constant to image.
* Imapplymatrix - Applies linear combination of color channels.
* Imcomplement - Complements an image.
* Imdivide - Divide one image into another or divide image by constant.
* Imlincomb - Linear combination of images.
* Immultiply - Multiplies two images or multiplies image by constant.
* Imsubtract - Subtracts one image from another or subtracts constant from image.

Question - 14:

Tell me can MATLAB run without graphics?

Ans:

At times scripts need to run without displaying the plots.
* By doing this, the script statement need not be commented.
* When working from home, running graphics over the network may be too slow.
* To perform the process, add the following lines of code:
%setenv DISPLAY /dev/null % MATLAB.
* By using these simple tricks, we can run MATLAB without graphics.

Question - 15:

Do you know how to correctly apply the graphics patches in MATLAB?

Ans:

Following is the sequence of commands to apply graphic patches in MATLAB.
* Open the LOCAL MACHINE window.
* Type the command xhost + ashland.
* Add the following code sequence before the plot command.
Figure;
Set(gcf,'renderer','zbuffer');
[s,w] = unix('echo $DISPLAY');
Set(gcf, 'XDisplay',w);

Question - 16:

Do you know what is LaTeX in MATLAB?

Ans:

MATLAB allows Greek letters.
* These letters are to be encoded.
* To encode these Greek letters, LaTeX is used.
MATLAB already handles naturally simple LaTeX encodings that allow introducing Greek lettters or modifying the font size and appearance in plots.

Question - 17:

Suppose if you know then tell me how to call MATLAB in batch mode?

Ans:

Batch mode execution of MATLAB can be done from command line or from makefile.
* A script is needed with extension .m.
* Specify all the commands that are to execute in sequential order in the script.
* The commands are placed in the script by using the command makefile
* To add the commands in command line mode, type all the commands at the command line in sequential order.
* The commands are executed soon after typing them at the command line.

Question - 18:

What is memory management functions in MATLAB?

Ans:

Below is the list of memory management functions.
* Clear - Removes variables from memory.
* Pack - Saves the existing variables to disk, and then reloads them contiguously.
* Save - Selectively persists variables to disk.
* Load - Reloads a data file saved with the save function.
* Quit - Exits MATLAB and returns all allocated memory to the system.

Question - 19:

Do you know how to Pre Allocate a Non Double matrix?

Ans:

Preallocatin a block of memor for holdin a non double matrix is memor efficient.

* It is faster to use the function 'repmat'.
* While allocating block of memory for a matrix, zeros are pre allocated to a matrix.
* The function to pre allocate memory is int8().
Ex: matrix = int8(zeros(100));
* Repmat function is used to create a single double matrix.
* Ex: matrix2 = repmat(int8(0), 100, 100);
* Thus non double matrix is pre allocated.

Question - 20:

What are the Basic Plots and Graphs of MATLAB?

Ans:

Following table describes basic plots and graphs.
* Box - Axis border
* Errorbar - Plots error bars along curve
* Hold - Retains current graph while adding new graphs
* Line - Creates line object
* LineSpec (Line Specification)&Syntax of Line Specification String
* Loglog - Log to log scale plot
* Plot - 2-D line plot
* Plot3 - 3-D line plot
* Plotyy - 2-D line plots with y-axis on both left and right side
* Polar - Polar coordinate plot
* Semilogx - Semilogarithmic plot
* Semilogy- Semilogarithmic plot
* Subplot- Creates axis in tiled positions
* Xlim - Sets or queries x-axis limits
* Ylim - Sets or queries y-axis limits
* Zlim - Sets or queries z-axis limits

Question - 21:

What are 3D visualization elements in MATLAB?

Ans:

3D visualization elements allow MATLAB to deal with 3D graphics.
* Surface and Mesh Plots - It includes plot matrices, visualize functions, color maps.
* View Control - Used to control camera viewpoint, rotation, zooming, and aspect ratio and set axis limits.
* Lighting - Used for adding and controlling scene lighting.
* Transparency - Used to specify object transparency.
* Volume Visualization - Used for volume data grid.

Question - 22:

What is handle graphics in MATLAB?

Ans:

Handle Graphics is a subsystem of MATLAB that handles graphics.
* Handle Graphics has high level commands for 2D and 3D data visualization.
* Image processing, animation and presentation graphics can be generated using Handle Graphics.
* Low level commands allow customizing the graphics appearances.
* Handle Graphics allows to build customized Graphics User Interfaces

Question - 23:

What is stress analysis in MATLAB?

Ans:

MATLAB is used in aerospace engineering, space environment.
* MATLAB is suitable for flexible dynamics.
* These domain experts conduct stress analysis on various structures like metallic and composite structures.
* To analyze the stress, NASTRAN, IDEAD, Oracle and PATRAN levels of proficiency is needed.
* The tasks are also used on aircraft that is metallic structure.
* The stress analysis includes control surface stiffness understanding, loop calculations, finite element modeling and fatigue testing requirement and analysis.

Question - 24:

Explain briefly MATLAB mathematical function library?

Ans:

MATLAB mathematical functions include computational algorithms.
* The elementary computational functions are sum, sine, etc.
* Matrix functions are available including matrix inversion.
* Special functions like Bessel are available.
* MATLAB includes transformation functions, namely Fourier Transformation Functions.

Question - 25:

What is MATLAB working environment?

Ans:

MATLAB working environment has various tools to work with MATLAB.
* It has facilities to manage variables.
* MATLAB supports export and import data across applications.
* Certain tools are available to develop and manage MATLAB files.
* Debugging and profiling of MATLAB applications are more flexible with MATLAB.

Question - 26:

Explain briefly about MATLAB language?

Ans:

MATLAB language is a high-level matrix language.
* It has control structures, functions, data structures, I/O and OOP features.
* Allows rapid creation of throw-away programs.
* Allows creating large and complex application programs.
* MATLAB API allows to author C and FORTRAN programs to interact with MATLAB.

Question - 27:

Do you know about MATLAB system parts?

Ans:

Following are the 5 main parts of MATLAB.
* MATLAB Languange.
* MATLAB working environment.
* Graphics handler.
* MATLAB mathematical library.
* MATLAB Application Program Interface.

Question - 28:

Explain about stress analysis in Matlab?

Ans:

People working on these areas as a aerospace engineers should have familiarity and exposure to NASTRAN and MATLAB with knowledge on space environment and modeling of flexible dynamics. These aerospace engineers will be responsible to conduct stress analysis on metallic and composite structures. NASTRAN, IDEAD, Oracle and PATRAN proficiency level is required. Their duties also include on aircraft which are metallic and composite structures. This includes and understanding of control surface stiffness and loop calculations, finite element modeling (FEM), fatigue testing requirement and analysis.

Question - 29:

How to call matlab in batch mode?

Ans:

This can be done from the command line or from a makefile. You need a script (filename.m). Just type at the command line, or include in the makefile: matlab<filename.m where filename.m can write to disk a figure, a binary, an ascii file, anything you want.

Question - 30:

How to correctly apply the graphics patches in Matlab?

Ans:

Open a LOCAL MACHINE window and type: xhost +ashland # Add the following code sequence just before the plot command that was giving you problems: figure; set(gcf,'renderer','zbuffer'); [s,w] = unix('echo $DISPLAY'); set(gcf,'XDisplay',w);

Question - 31:

Can we run Matlab without graphics?

Ans:

Sometimes you may want to run scripts which contain plotting commands without displaying the plots and without going into the script to comment out the commands. An example: if you're working from home and it's too slow to run graphics over the network. You can play a simple UNIX trick: % setenv DISPLAY /dev/null % matlab

Question - 32:

Explain LaTeX in Matlab?

Ans:

Matlab already handles naturally simple LaTeX encodings that allow introducing Greek lettters or modifying the font size and appearance in plots.

Question - 33:

On what machines Matlab should be run?

Ans:

We will run it from sthelens, and only if sthelens is down, from cher, orsay or tiree. It works on other machines too, but some of the other machines have older versions of the OS and core dump upon exiting from matlab. Some other local machines with new setups work fine. Try your local machine. Matlab is blocked from running on the servers

Question - 34:

Vectorization What is that in Matlab? How to do it ?

Ans:

Thinking is terms of full matrices/vectors and also some related functions for that * Use of filter(), which works beautifully for some time series models

Question - 35:

What can we use Matlab for?

Ans:

Simple calculations 2. Plotting and analyzing mathematical relationships (2D and 3D) 3. List & Matrix Operations 4. Writing script files (a type of programming) 5. Symbolic manipulation of equations 6. Advanced visualization, animation and GUI interface tools

Question - 36:

how to Add noise to an image in Matlab?

Ans:

The function noise.m, now installed on ashland too, adds Gaussian, uniform, salt and pepper, additive or multiplicative noise to an image.

Question - 37:

Explain The MATLAB Application Program Interface (API)?

Ans:

This is a library that allows you to write C and Fortran programs that interact with MATLAB. It include facilities for calling routines from MATLAB (dynamic linking), calling MATLAB as a computational engine, and for reading and writing MAT-files.

Question - 38:

Explain The MATLAB mathematical function library?

Ans:

This is a vast collection of computational algorithms ranging from elementary functions like sum, sine, cosine, and complex arithmetic, to more sophisticated functions like matrix inverse, matrix eigenvalues, Bessel functions, and fast Fourier transforms.

Question - 39:

Explain Handle Graphics in Matlab?

Ans:

This is the MATLAB graphics system. It includes high-level commands for two-dimensional and three-dimensional data visualization, image processing, animation, and presentation graphics. It also includes low-level commands that allow you to fully customize the appearance of graphics as well as to build complete Graphical User Interfaces on your MATLAB applications.

Question - 40:

Explain The MATLAB working environment?

Ans:

This is the set of tools and facilities that you work with as the MATLAB user or programmer. It includes facilities for managing the variables in your workspace and importing and exporting data. It also includes tools for developing, managing, debugging, and profiling M-files, MATLAB's applications.

Question - 41:

Explain The MATLAB language?

Ans:

This is a high-level matrix/array language with control flow statements, functions, data structures, input/output, and object-oriented programming features. It allows both "programming in the small" to rapidly create quick and dirty throw-away programs, and "programming in the large" to create complete large and complex application programs.

Question - 42:

What are the MATLAB System Parts?

Ans:

The MATLAB system consists of five main parts:
* The MATLAB language.
* The MATLAB working environment.
* Handle Graphics.
* The MATLAB mathematical function library.
* The MATLAB Application Program Interface (API).

Question - 43:

What Is MATLAB?

Ans:

MATLAB is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation. Typical uses include:
* Math and computation
* Algorithm development
* Modeling, simulation, and prototyping
* Data analysis, exploration, and visualization
* Scientific and engineering graphics
* A   lication development, including Graphical User Interface building

MatLab Viva Questions and Answers

1) Explain what is MatLab? Where MatLab can be applicable?

MatLab is a high-level programming language with an interactive environment for visualization, numerical computation and programming function.

Matlab can be applicable at numerous instances like

• Allows matrix manipulations
• Plotting of functions and data
• Implementation of algorithms
• Creation of user interfaces
• Analyze data
• Develop algorithm
• Create models and applications
• Interfacing with programs written in other languages (C++, C, Java and Fortran)

2) What does MatLab consist of?

MatLab consists of five main parts

• MatLab Language
• MatLab working environment
• Handle Graphics
• MatLab function library
• MatLab Application Program Interface (API)

3) Explain MatLab API (Application Program Interface)?

MatLab API is a library that enables you to write Fortran and C programs that interact with MatLab. It contains the facilities for calling routines from MatLab, for reading and writing Mat files and calling Matlab as a computational engine.

4) What are the types of loops does Matlab provides?

Matlab provides loops like

- While Loop
- For Loop
- Nested Loops

5) List out the operators that MatLab allows?

Matlab allows following Operators

- Arithmetic Operators
- Relational Operators
- Logical Operators
- Bitwise Operations
- Set Operations
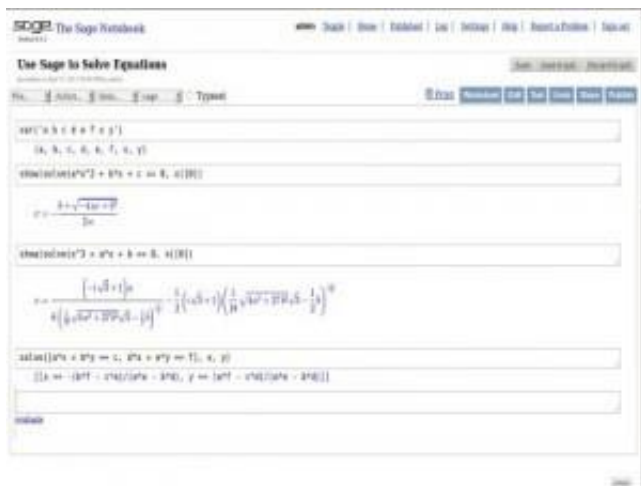
6) Explain what is Simulink?

Simulink is an add-on product to MatLab, it provides an interactive, simulating, graphical environment for modeling and analyzing of dynamic systems.

7) In MatLab is it possible to handle multi-dimensional arrays?

Yes, it is possible in MatLab to handle multi-dimensional arrays. Matlab's internal data structure is limited to a two-dimensional matrix. But to handle multi-dimensional arrays in Matlab, you can create your own functions in Matlab language.

8) Mention what is the sign convention used in MatLab's fft routines?

The sign convention used in MatLab's fft routines are defined as sum(x(i)*exp (-j*i*k/N)) and not sum (x(i)exp(j*i*k/N)). The first version is used by engineers, and the second is used by mathematician.

9) What are the four basic functions to solve Ordinary Differential Equations (ODE)?

The four basic functions that MatLab has to solve ODE's are

• Quad
• Quad8
• ODE23
• ODE45

10) Explain how polynomials can be represented in MatLab?

A polynomial in MatLab is denoted by a vector. To create a polynomial in MatLab enter each co-efficient of the polynomial into the vector in descending order

11) What is the type of program files that MatLab allows to write?

Matlab allows two types of program files

• Scripts: It is a file with .m extension. In these files, it writes series of command that you want to execute together. It does not accept inputs and do not return any outputs

• Functions: They are also files with .m extension. Functions can accept inputs and return outputs.

12) Explain how to modify the MatLab Path?

To modify the MatLab Path use the PathTool GUI. Also, you can use add path directories from the command line and add the path to rc to write the current path back to 'pathdef.m.' In the case if you don't have permission to write for 'pathdef.m' then pathrc can be written into a different file, you can execute from your 'startup.m.'

13) Explain what is LaTex in MatLab?

MatLab handles naturally simple LaTex encoding which allows introducing greek letters or modifying the font size and appearance in plots.

14) Explain how you can pre-allocate a Non-Double Matrix?

Pre-allocating a block of memory for holding a non-double matrix is memory efficient. While allocating blocks of memory for a matrix, zeros are pre-allocated to a matrix.

The functions to pre allocate memory is int8(), example matrix =int8(zeros(100));

Repmat function is used to create a single double matrix, example matrix2=repmat(int8(0), 100, 100)

15) What is Xmath-Matlab? Mention the Xmath features?

For Xwindow workstations, Xmath is an interactive scripting and graphics environment.

Following are the X-math features

• Scripting language with OOP features
• Libraries that are LNX and C language compatible
• A debugging tools with GUI features
• Color graphics can be pointed and clickable

16) Name the graphic system used in MatLab?

Graphic system used in MatLab is known as handle graphics. It has a high level and low-level commands.

• High Level Commands: High level command performs image processing, data visualization and animation for 2D and 3D presentation graphics

• Low Level Commands: Full customization of the appearance of graphics and building of complete graphical user interface

17) Explain what is M-file and MEX files in MatLab?

M files: They are just a plain ASCII text that is interpreted at run time. They are like sub-programs stored in text files with .m extensions and are called M-files. For most of the MatLab, development M-files are used.

MEX files: They are basically native C or C++ files which are linked directly into the MatLab application at runtime. MEX files have efficiency to crash the MatLab application.

18) Explain what is Interpolation and Extrapolation in Matlab? What are their types?

• Interpolation: Taking out function values between different data points in an array is referred as Interpolation

• Extrapolation: Finding function values beyond the endpoints in array is referred as Extrapolation

The two types of Interpolation and Extrapolation are

• Linear Interpolation and Extrapolation
• Quadratic Interpolation and Extrapolation

19) List out some of the common toolboxes present in Matlab?

Some of the common toolboxes in Matlab are

• Control System
• Fuzzy Logic
• Image Processing
• LMI control
• Neural Networks
• Robust Control
• System Identification

20) What is Get and Set in Matlab?

Get and Set are referred as getter and setter functions. For assigning properties, setter functions are used while for accessing properties getter functions are used.

1. AUTOCAD

INSTRUCTIONS TO STUDENTS

1. Students are required to remove their footwear outside the center and keep it in the box provided for the same.

2. Students should leave their belongings outside the lab except their observation note book, the concerned books/manuals and calculators.

3. Students are requested not to place their legs on the wall or on the table.

4. Students should refrain from leaning on the table and sitting on it.

5. Before logging in to a particular terminal, if there is something wrong in the terminal, the student should report the same immediately to the concerned staff.

6. Students should not use any disks brought from outside without prior permission from the concerned staff.

7. Students can get the required manual or disks from the staff after signing in the appropriate register.

8. Students should collect their printouts before leaving the lab for that particular session.

9. Before leaving the Terminal, the students should logout properly and leave their chairs in Position.

10. Students are not allowed to take any manual outside the center.

11. Edibles are strictly prohibited in the center.

12. No internet browsing allowed during the lab hours.

Launching AutoCad

1. Start
2. 3D and CAD
3. AutoCad
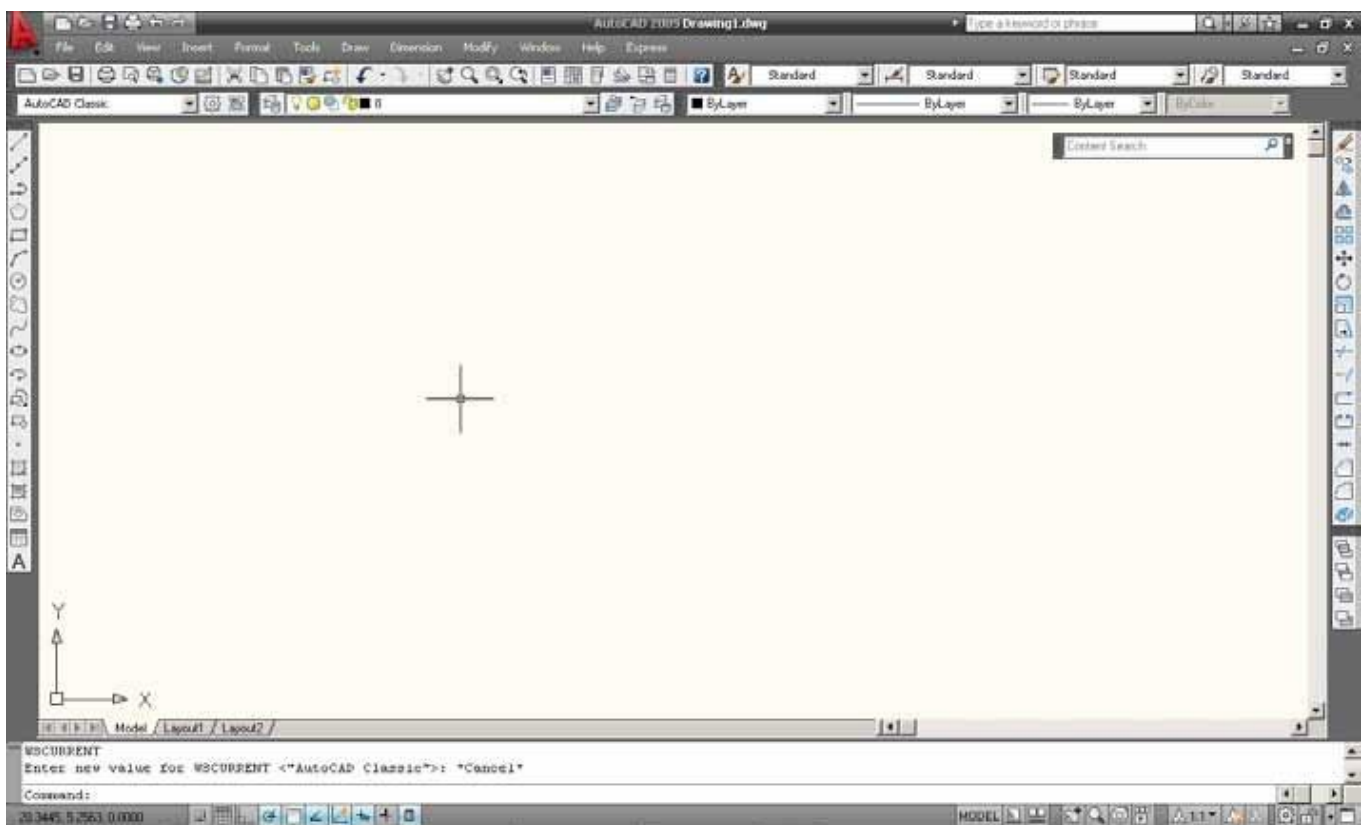
Typing Commands

Typing a Command

All AutoCAD commands can be typed in at the command line. Many commands also have one

or two letter aliases that can also be typed as shortcuts to the commands.

1. Type the desired command at the command prompt.

Command : **LINE**

or

2. Type the command's alias. Command: **L**

3. Press **ENTER/Space** to end**.**

4. Type an option at the command prompt.

TIP: Many AutoCAD commands require you to press ENTER to complete the command. You know you are no
longer in an AutoCAD command when you see a blank command line.

Reissuing the Last Command

The last used AutoCAD command can be re-entered by one of the following three methods

of ENTER. The ENTER key on the keyboard will always act as ENTER, the SPACEBAR and

RIGHT MOUSE will act as enter most of the time (exceptions include placing TEXT).

1. Press the **ENTER** key on the keyboard

or

2. Press the **Space bar** on the keyboard.

or

3. Click the **right** mouse button.

Pointing Device (Mouse)

AutoCAD uses either a mouse or digitizing tablet to select objects in a drawing.

Left Mouse Button

Used to pick or select objects

1. Click the left mouse button to select an object area in the drawing.

2. Press **ESC** twice to deselect an object (or to cancel a command).

Right Mouse Button

Used to enter a command, repeat last command, or access shortcut menus.

1. Click the right mouse button.

TIPS:
• SHIFT + the right mouse button brings up the object snap menus.
• Various screen locations for the mouse brings up different menus.• menus.
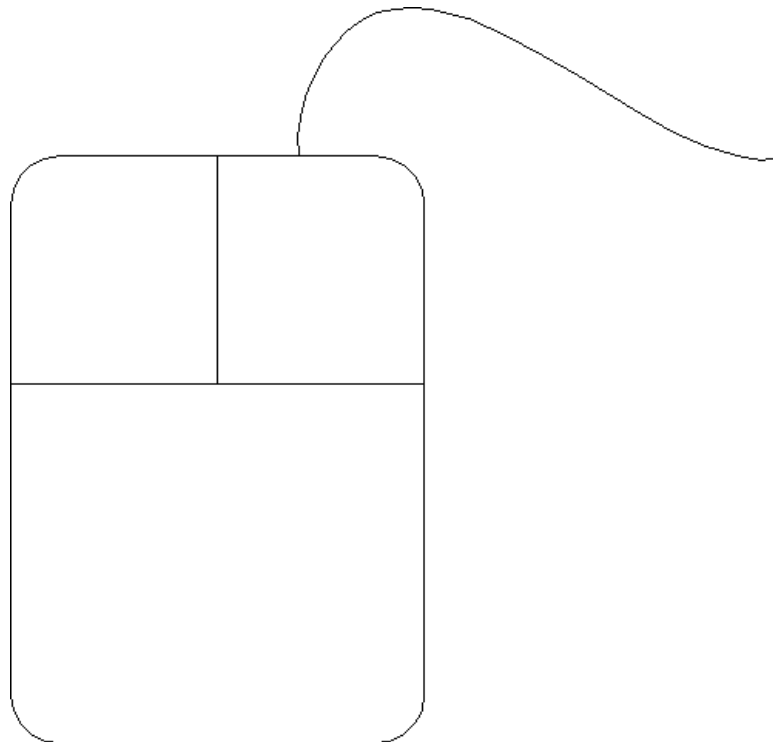
PAN

Shifts the location of a view.

1. **Choose** View, Pan.

   or

2. **Click** the Pan icon.

   or

3. **Type** PAN from the command prompt.

   Command: **PAN** or **P**

TIPS:

- While in the PAN command, click with the right mouse button to see the following menu.

  Exit

  ✔ Pan
  Zoom
  3D Orbit

  Zoom Window
  Zoom Original
  Zoom Extents
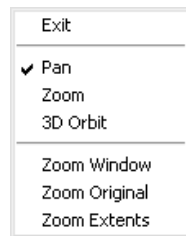
- Panning can also be done by using the window scroll bars

ZOOM

Increases or decreases the apparent size of objects in the current viewport

1. **Choose**   View, Zoom.

                         or

2. **Click**   a Zoom icon.

                         or

3. **Type**   ZOOM at the command prompt.

                         Command: **Zoom** or **Z**

4. **Type**   One of the following zoom options:

The following are basic zoom options:

All   Places entire drawing (all visible layers) on
                         display at once. Forces a regeneration.

Extents   Displays current drawing content as large as possible.

Previous   Restores previous view.

Window   Designates rectangular area to be drawn as large as
                         possible.

Number   Magnification relative to ZOOM All display

Number X   Magnification relative to current display (1X)

Center   Specifies center point and new display height.

Dynamic   Permits you to pan a box representing the viewing
                         screen around the entire generated portion of the
                         drawing and enlarge or shrink it.

TIPS:

-While in the ZOOM command, click with the right mouse button to see the
menu to the right.
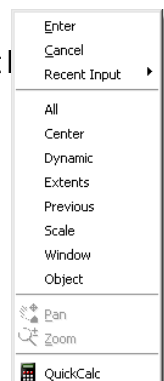
Creating a New Drawing

NEW Command

Creates a new drawing file.

1. **Choose**   File, New.

   or

2. **Press**   CTRL + N

   or

3. **Click**   the New icon.

   or

4. **Type**   NEW at the Command prompt.

   Command: **NEW**

5. **Choose**   One of the options for creating a new drawing.

6. **Click**   The OK button.

7. **Save**   the drawing as another name.
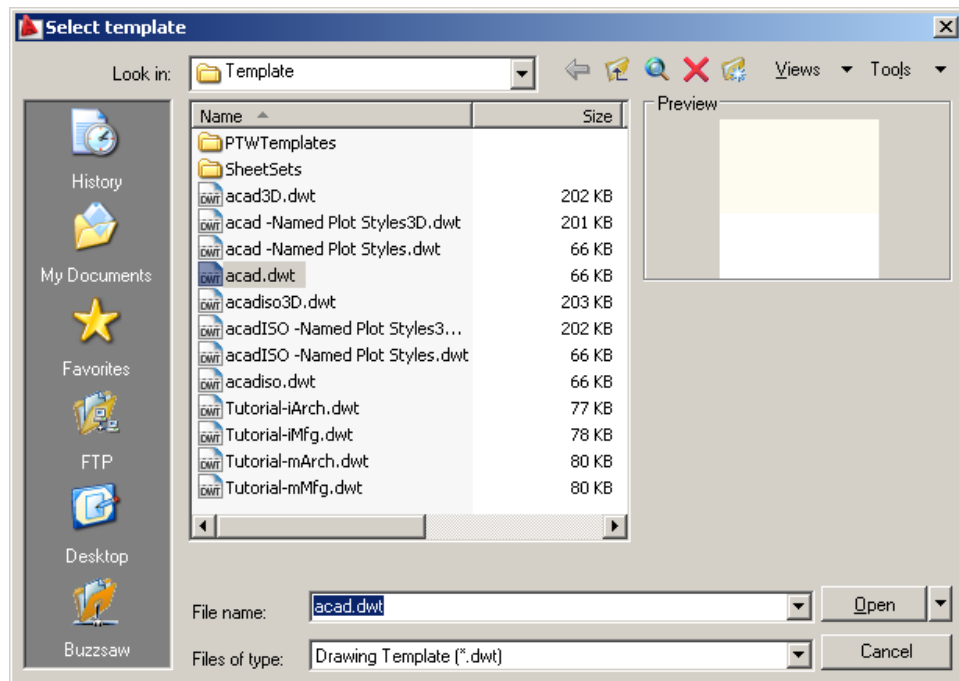
TIP:

New drawings can also be created from Template Files.

Undo and Redo

Reverses the last action.

1. Choose **Edit, Undo**.

    or

2. Click the Undo icon.

    or

3. Press **CTRL + Z**.

4. Type U at the command prompt to undo the last command.

    Command: **U**

Redo

Reverses the effects of a single UNDO or U command.

1. Choose **Edit, Redo**.

    or

2. Click the Redo icon.

    or

3. Type REDO at the command prompt to redo the last undo command.

    Command: **REDO**

TIPS:

-UNDO has no effect on some commands and system variables, including those that open, close, or save a window or a drawing, display information, change the graphics display, regenerate the drawing, or export the drawing in a different format.

-REDO must immediately follow the U or UNDO command.

Function Keys and Accelerator Keys

F1	Displays Help
F2	Toggles Text Window
F3	Toggles OSNAP
F4	Toggles TABMODE
F5	Toggles ISOPLANE
F6	Toggles UCSDETECT
F7	Toggles GRIDMODE
F8	Toggles ORTHOMODE
F9	Toggles SNAPMODE
F10	Toggles Polar Tracking
F11	Toggles Object Snap Tracking
F12	Toggles Dynamic Input

ALT+F11	Displays the Visual Basic Editor
ALT+F8	Displays the Macros dialog box
CTRL+0	Toggles Clean Screen
CTRL+1	Toggles Properties palette
CTRL+2	Toggles DesignCenter
CTRL+3	Toggles the Tool Palettes Window
CTRL+4	Toggles Sheet Set Manager
CTRL+5	Toggles Info Palette
CTRL+6	Toggles dbConnect Manager
CTRL+7	Toggles Markup Set Manager
CTRL+8	Toggles the QuickCalc calculator palette
CTRL+9	Toggles the command window
CTRL+A	Selects objects in drawing
CTRL+SHITF+A	Toggles Groups
CTRL+B	Toggles Snap
CTRL+C	Copies objects to Clipboard
CTRL+SHIFT+C	Copies objects to Clipboard with Base Point
CTRL+D	Toggles Dynamic UCS
CTRL+E	Cycles through isometric planes
CTRL+F	Toggles running object snaps
CTRL+G	Toggles Grid
CTRL+H	Toggles PICKSTYLE
CTRL+I	Toggles COORDS

CTRL+J	Repeats last command
CTRL+L	Toggles Ortho mode
CTRL+M	Repeats last command
CTRL+N	Creates a new drawing
CTRL+O	Opens existing drawing
CTRL+P	Prints current drawing
CTRL+R	Cycles layout viewports
CTRL+S	Saves current drawing
CTRL+SHIFT+S	Brings up the Save As dialog box
CTRL+T	Toggles Tablet mode
CTRL+V	Pastes data from Clipboard
CTRL+SHIFT+V	Pastes data from Clipboard as a Block
CTRL+X	Cuts objects to Clipboard
CTRL+Y	Cancels the preceding Undo action
CTRL+Z	Reverses last action
CTRL+[	Cancels current command
CTRL+\	Cancels current command
CTRL+PAGE UP	Moves to the next layout tab to the left of the current tab
CTRL+PAGE DOWN	Moves to the next layout tab to the right of the current tab

Open Existing Drawings

1.	**Choose**	File, OPEN.
		or
2.	**Press**	CTRL + O.
		or
3.	**Click**	the OPEN icon.
		or
4.	**Type**	OPEN at the command prompt.
		Command: **OPEN**
5.	**Press**	ENTER
6.	**Double Click**	the desired directory to find the drawing to open.
7.	**Click**	the drawing name to open.
8.	**Click**	The OK button.
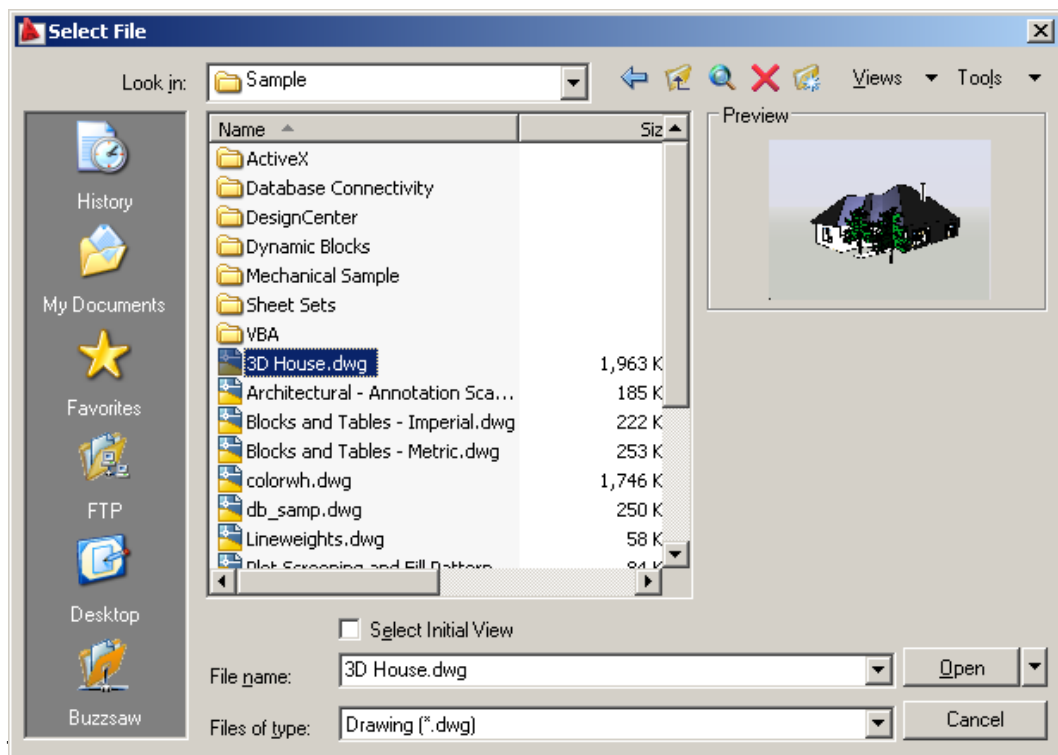
-Preview shows a bitmap image of the drawing selected. This image is the view that was last saved in the drawing. It will not show a preview of drawings saved before R13 AutoCAD.

Quick Save

The QSAVE command is equivalent to clicking Save on the File menu.

If the drawing is named, AutoCAD saves the drawing using the file format specified on the Open and Save tab of the Options dialog box and does not request a file name. If the drawing is unnamed, AutoCAD displays the Save Drawing As dialog box (see SAVEAS) and saves the drawing with the file name and format you specify.

1. **Press** CTRL + S.

   or

2. **Click** the Save icon.

   or

3. **Type** QSAVE at the command prompt,

   Command:**QSAVE**

TIPS:

Drawings can be saved as different versions of AutoCAD (e.g. R13, R14, R 2000, etc.)

AutoSave settings under Tools, Options…
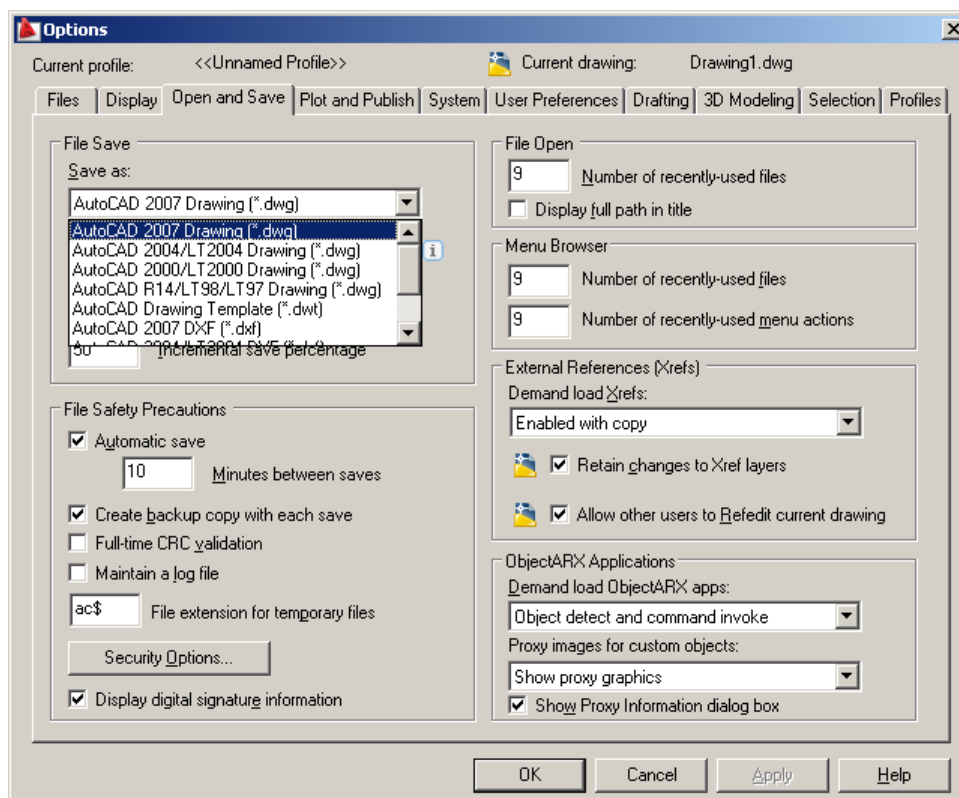
Useful Commands

Running Object Snaps

An object snap mode specifies a snap point at an exact location on an object. OSNAP specifies running object snap modes, which remain active until you turn them off.

1. **Choose**   Tools, Drafting Settings...

   or

2. **Type**   DDOSNAP at the command prompt

   Command: **DDOSNAP**

   or

3. **Click**   OSNAP on the Status Bar.

4. **Right Click** the Object Snap TAB.

5. **Choose**   an object snap to turn ON/OFF from the dialog box.
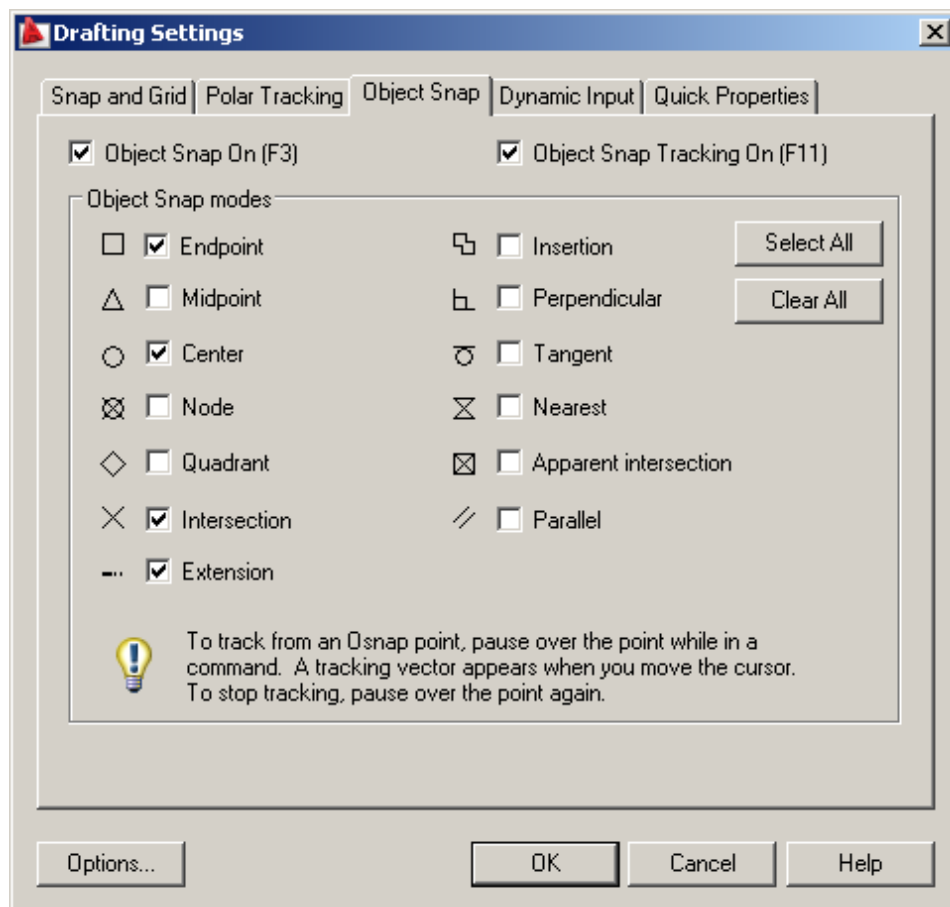
UNITS Command

1. **Choose** Format, Units...
   or
2. **Type** DDUNITS at the command prompt.

   Command: **DDUNITS or UN**

3. **Choose** a units and angle setting.
4. **Choose** a precision setting.
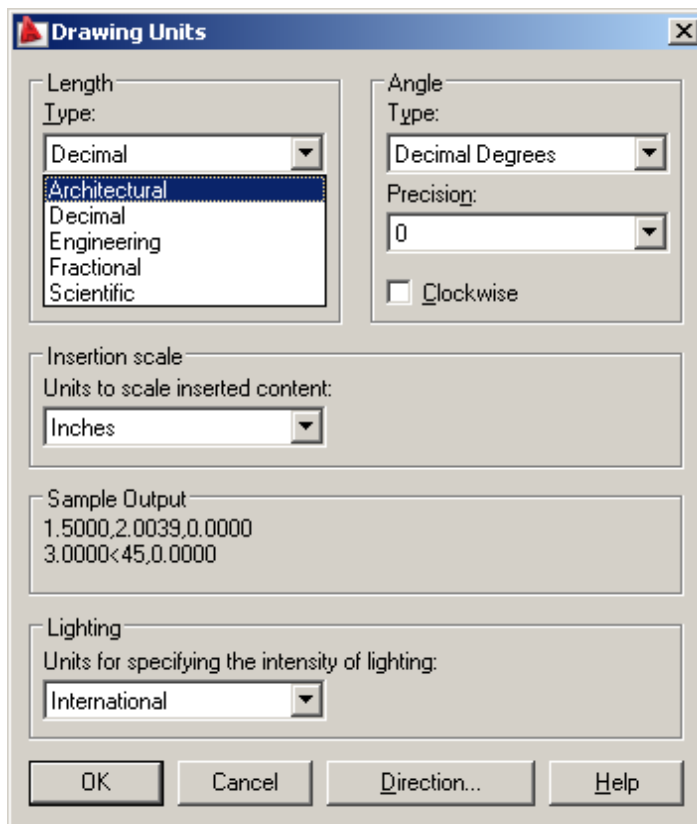
Cartesian Coordinate System

AutoCAD provides the user with an infinite two dimensional area to work with. Any entities place on the working two dimensional plane can be defined relative to the Cartesian coordinate system.

The Cartesian coordinate system divides a two dimensional plane with two perpendicular axis. The X axis runs horizontal across the bottom of the screen. The Y axis runs vertically along the left side of the screen. These two axis intersect at the bottom left corner of the screen.

Each of these axis is further divided into segments. Each segment is given a value. The X axis segments increase in value to the right. The positive X values are to the right of the intersection of the two axis. The negative X values are to the left. The positive Y values are above the intersection and increase up. The negative Y values are below.
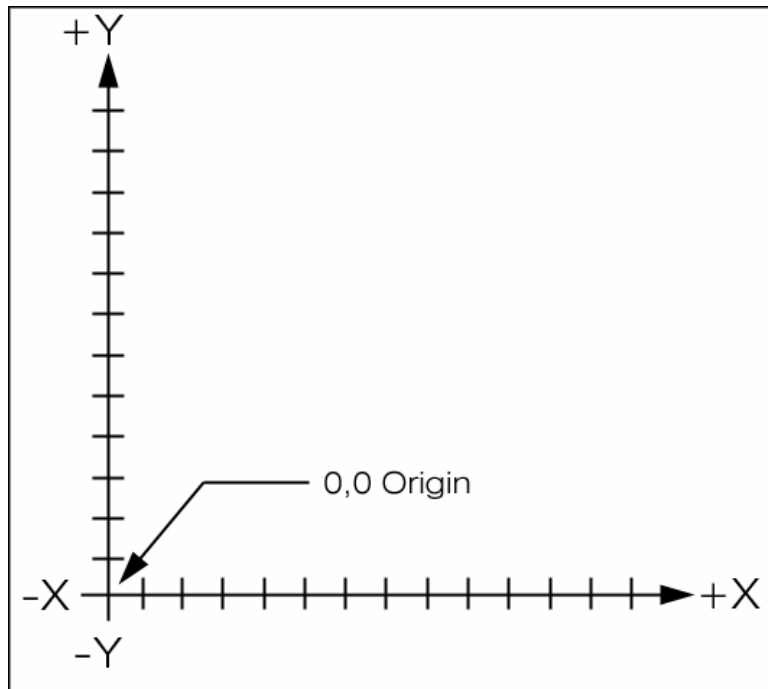
AutoCAD 2D Tutorial

Absolute Coordinates

1. **Type**   x,y coordinate when AutoCAD asks for a point.

    From point: **1,1**

    To point: **2,1**

    To point: **2,2**

    To point: **1,2**

    To point: **1,1**

    ```
    1,2           2,2




    1,1           2,1
    ```
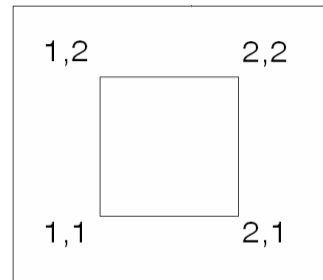
Relative Coordinates

1. **Type**   @deltax,deltay when AutoCAD asks for a point.

    From point pick point

    To point: **@1,0**

    To point: **@0,1**

    To point: **@-1,0**

    To point: **@0,-1**

    ```
    @-1,0              @0,1




    pick
    point              @1,0
    ```
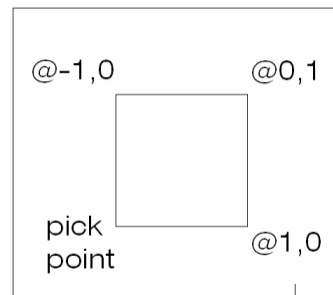
Polar Coordinates

1. **Type**   @distance<angle when AutoCAD asks for a point.

    From point: pick point

    To point: **@1<0**

    To point: **@1<90**

    To point: **@1<180**

    To point: **@1<270**

    ```
    @1<180            @1<90




    pick
    point             @1<0
    ```
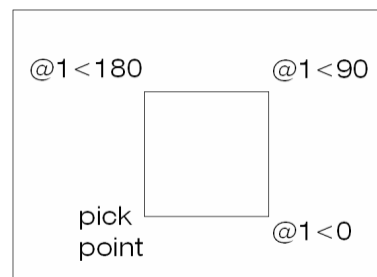
Polar Tracking

Polar Snaps work independently from snaps. With Polar Snaps on, AutoCAD shows the distances and angles being displayed as the cursor moves.

1. **Choose**   Tools, Drafting Settings

            or

2. **Type**   DDSETTINGS at the command prompt.

         Command : **DDESTTINGS**

3. **Choose**   the Polar trackingTAB from the dialog box.

4. **Select**   the desired incremental angle from the dropdown list (or create a new angle).
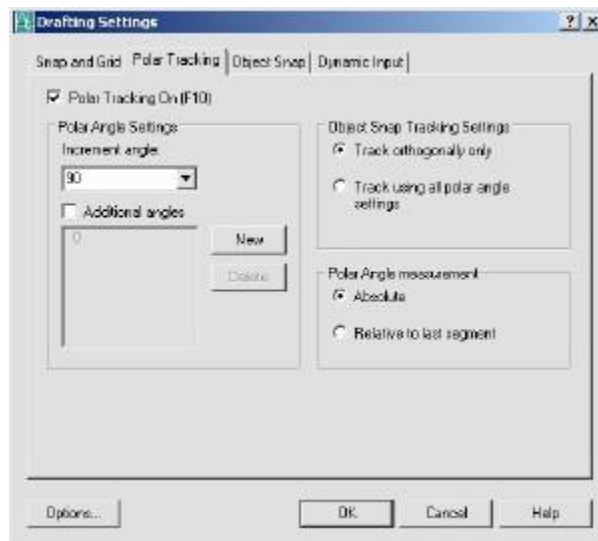
5. **Pick**   OK to exit the dialog box.

6. **Draw**   a LINE using the Polar Snap references.
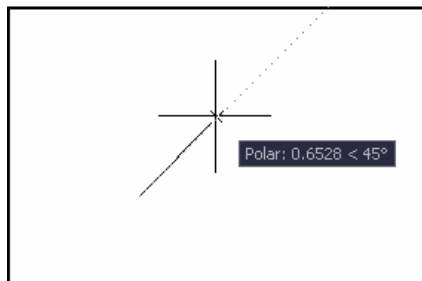
Line Command

Creates single straight line segments

1.	**Choose**	Draw, Line.
		or
2.	**Click**	the Line icon.
		or
3.	**Type**	LINE from the command prompt
		Command: **LINE** or **L**
4.	**Press**	ENTER
5.	**Pick**	From point: (**point**)
6.	**Pick**	Specify next point or [Close/Undo]:(**point**)
7.	**Pick**	Specify next point or [Close/Undo]:(**point**)
8.	**Press**	ENTER to end line sequence
		or
9.	**Type**	U to undo the last segment
		To point: **U** (undo)
		or
10.	**Type**	C to create a closed polygon
		To point : **C** (close)
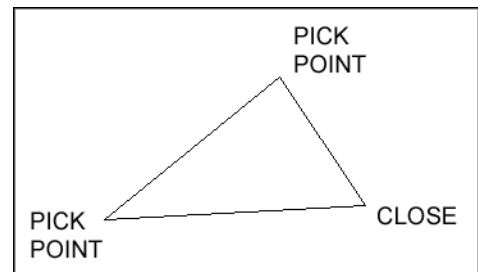
TIPS:

• You can continue the previous line or arc by responding to
the From point: prompt with a space or ENTER.

• Choose the right mouse button for the line pop-up menu to
appear while in the line command
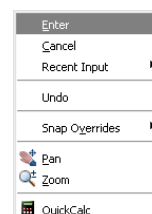
Pline Command

A polyline is a connected sequence of line segments created as a single object. You can create straight line segments, arc segments, or a combination of the two.

1. **Choose**   Draw, Polyline.

   or

2. **Pick**   the Pline icon.

3. **Type**   PLINE at the command prompt

   Command : **PLINE** or **PL**

4. **Pick**   A point on the drawing to start the polyline

   From point:(**select**)

5. **Type**   One of the following options
   Arc/Close/Halfwidth/Length/Undo/Width/<endpoint of line>:

   or

6. **Pick**   A point to continue drawing
   Arc/Close/Halfwidth/Length/Undo/Width/<endpointof line>: (**pick point**)

Polyline as one segment
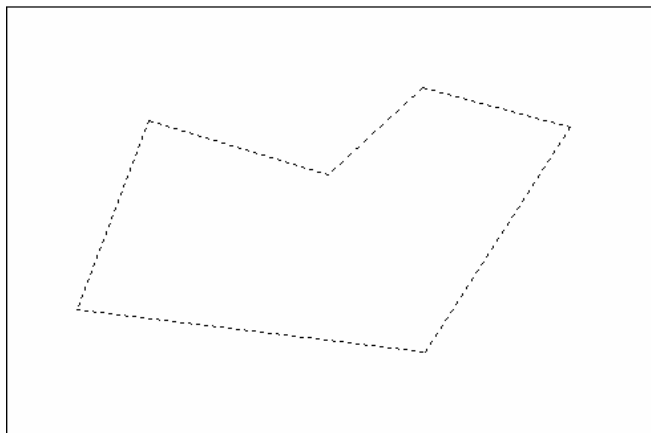
Orthogonal Lines

Controls lines from being drawn at various angles to straight lines. When the snap grid is rotated, ortho mode rotates accordingly.

1. **Press**   Function Key **F8**.

    or

2. **Double Click**   ORTHO from the Status Bar.

    or

3. **Press**   CTRL + L.

Line drawn
with
ORTHO ON

Line drawn
with
ORTHO
OFF
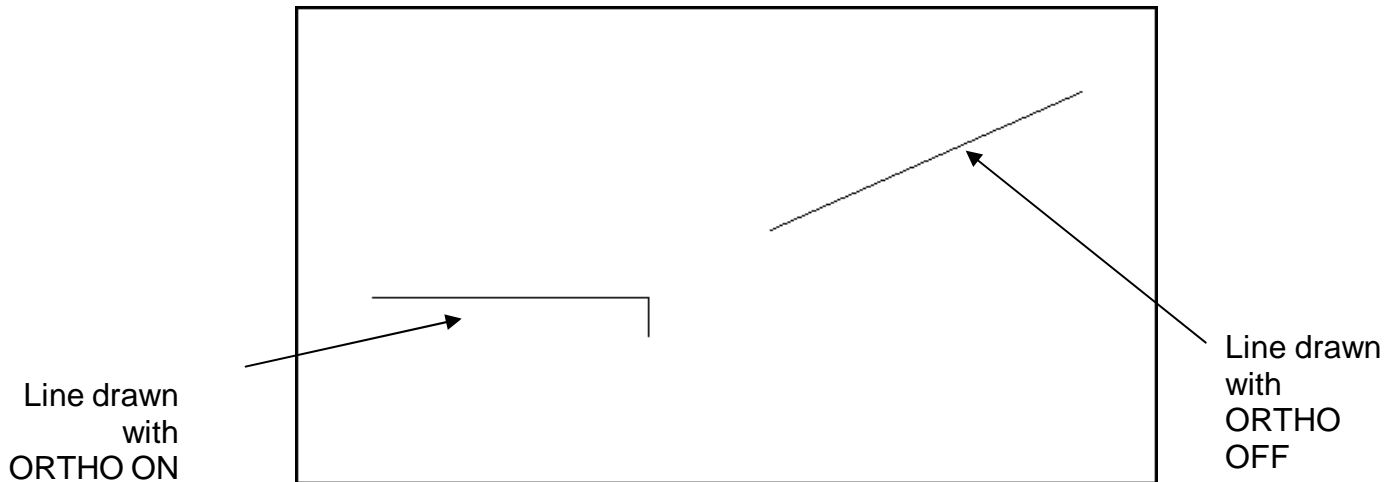
Rectangle

1. **Choose**   Draw, Rectangle.

    or

2. **Click**   the Rectangle icon.

3. **Type**   Rectang at the command prompt Command:
                   RECTANG Chamfer/Elevation/Fillet/Thickness/Width/

                   <First corner>:
4. **Pick**   first corner.
5. **Pick**   other corner or type coordinates **(i.e. @4,2)**.

Other Corner

First Corner
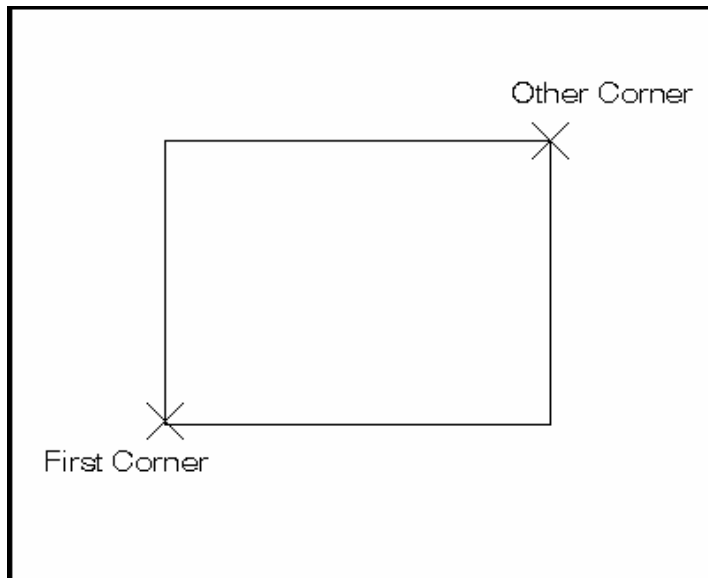
Circles

Circle Command

Circle, Center Radius

1. **Choose** Draw, Circle.

 or

2. **Click** the Circle icon. ⊘

 or

3. **Type** CIRCLE at the command prompt.

 Command: **CIRCLE**

Circle, Center Diameter

4. **Type** One of the following options:
 3P/2P/TTR/<<center point>>:

 or

5. **Pick** A center point.

6. **Type** A radius or diameter.

 or

7. **Pick** A radius or diameter
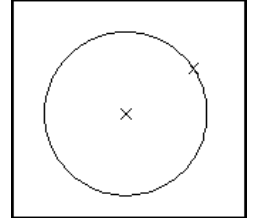
 Diameter/<<radius>>:
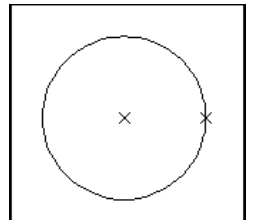
Circle, Tangent, Tangent Radius

TIPS:

- To create circles that are the same size, press
 ENTER when asked for the circle radius.

- When selecting a circle with a pickbox, be sure
 to select the circumference of the circle.

Circle, Tangent, Tangent, Tangent
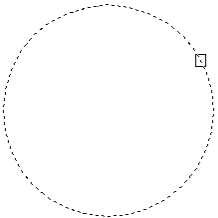
Arc Command

1. **Choose**   Draw, Arc.

                 or

2. **Click**   the Arc icon.

                 or

3. **Type**   ARC at the command prompt

               Command: **ARC**

4. **Draw**   One of the arcs.

TIPS:

-Except for 3 point arcs, arcs are drawn in a COUNTERCLOCKWISE direction.

- While in the arc command, press the right mouse button to select the following options for arcs:
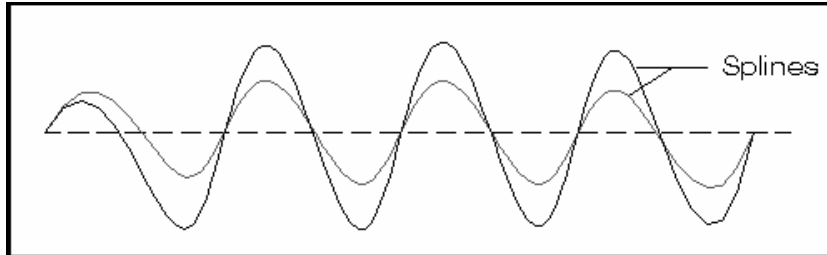
Arc Examples

3 point arc

Start ,center, chord length

start, center, end

Start, end, radius

Start , center, included angle

Start, end, direction
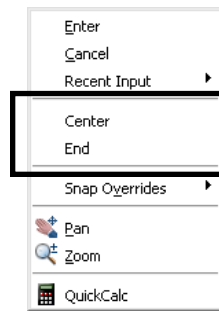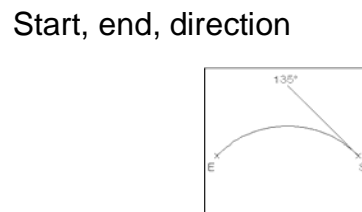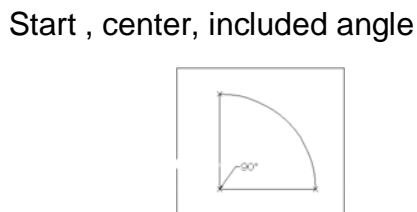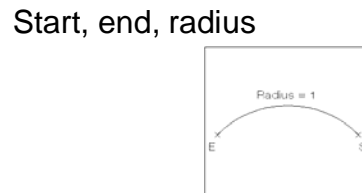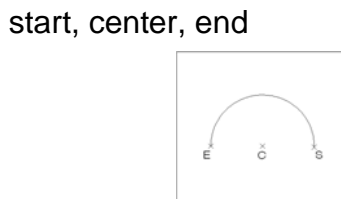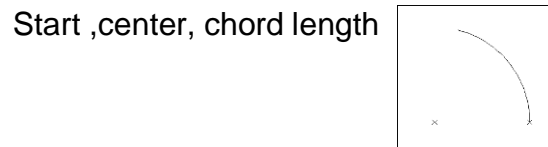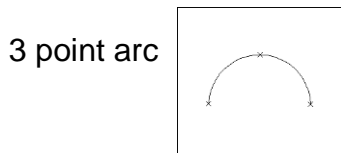
Spline

The SPLINE command creates a particular type of spline known as a nonuniform rational B-spline (NURBS) curve. A NURBS curve produces a smooth curve between control points

| 1. | **Choose** | Draw, Spline. |
		or
2.	**Click**	the Spline icon.
		or
3.	**Type**	SPLINE at the command prompt
		Command: **SPLINE**
4.	**Pick**	A start point for the spline
		Object / <Enter first point>: (**pick point**)
5.	**Pick**	Points until you are done drawing splines
		Enter point: (**pick points**)
6.	**Press**	Enter or close to complete the spline
7.	**Pick**	Starting tangent point for the spline
		Enter start tangent (**pick point**)
8.	**Pick**	Ending tangent point for the spline
		Enter end tangent: (**pick point**)
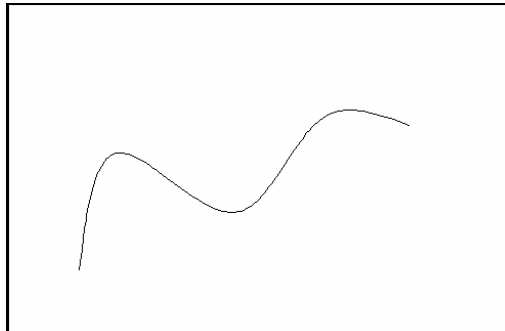
Editing

Editing Polylines

| 1.	**Choose**	*Modify, Polyline.*
		or
2.	**Pick**	the Pediticon from the Modify II toolbar.
3.	**Type**	PEDIT at the command prompt
		Command: **PEDIT**
4.	**Pick**	Pick a polyline to edit
		Select Polyline:(**pick**)
5.	**Type**	One of the following options:Close/Join/ Width/Edit vertex/FitCurve/Spline/Curve/
		Decurve/Undo/eXit

PEDIT options:

| **Close**	Closes open polyline segments
Join	Connects polylines, lines, and arcs to existing polylines.
Width	Changes the width for all polyline segments.
Fit curve	Creates curved arc segments around pline vertices at the direction you specify.
Spline Curve	Creates a curve through control points on a polyline.
Decurve	Straightens curved segments.
Edit Vertex	Displays the following Edit Vertex Options:

Polyline width change
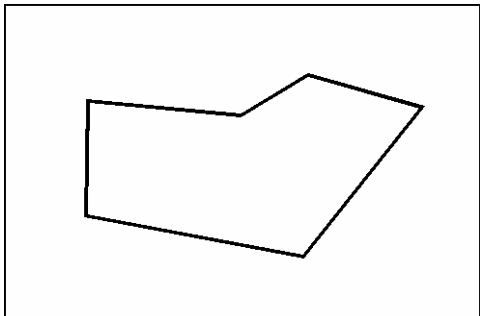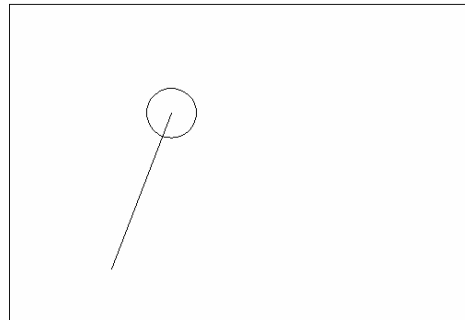
Splined Polyline
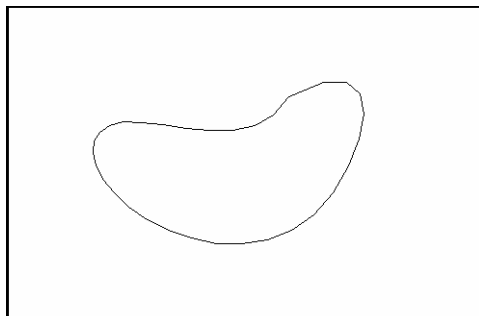
Move Command

1. **Choose**   Modify, Move.

   or

2. **Click**   the Move icon.

   or

3. **Type**   MOVE at the command prompt

   Command: **MOVE or M**

4. **Pick**   Objects to move

   Select objects: (**select**)

5. **Pick**   A point to move from

   Base point or displacement: (**pick point**)

6. **Pick**   A point to move to

   Second point of displacement: (**pick point**)
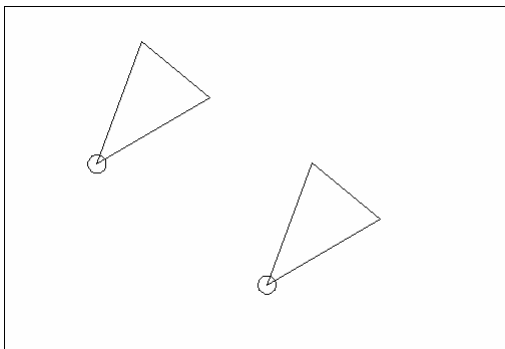
Circle before move
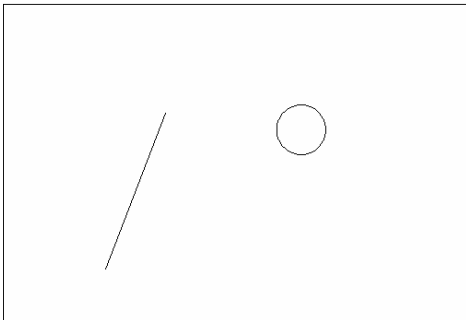
Circle after move

TIP:

To move an object a specified distance, type a distance at the second
point of displacement prompt: **@1<0**

Copy Command
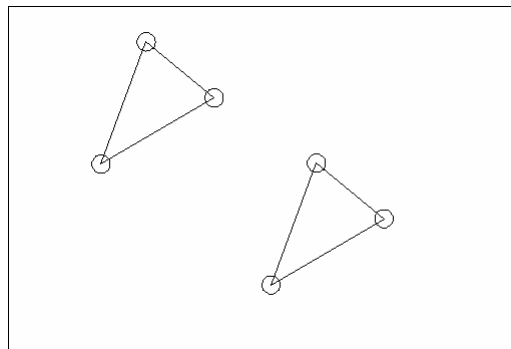
1. **Choose**   Modify, Copy.

           or

2. **Click**   the Copy icon.

           or

3. **Type**   COPY at the command prompt.

           Command: **COPY or CP**

4. **Pick**   Objects to copy.

           Select objects: (**select**)

5. **Pick**   A point to move from.

           Base point or displacement/Multiple: (**pick point**).

6. **Pick**   A point to copy to.

           Second point of displacement: (**pick point**)
                           or

7. **Type**   A point to copy to.

           Second point of displacement: **@ 1<0**

Duplicate objects copied   *Multiple objects copied*

TIP:

*   To copy many objects in the same copy command, type M for Multiple at the "Base point or displacement/Multiple" option.

Offset Command

### Offset Distance

To offset a specified distance:

1.	**Choose**	Modify, Offset.

or

| 2. | **Choose** | the Offset icon. |

or

| 3. | **Type** | OFFSET at the command prompt. |

Command: **OFFSET or O**

| 4. | **Type** | The distance to offset. |

Offset distance or <Through point>: (**number**)

| 5. | **Pick** | The object to offset. |

Select object to offset: (**select object**)

| 6. | **Pick** | A side to offset object to. |

Side to offset: (**pick side**)

| 7. | **Pick** | Another object to offset |

Select object to offset: (**pick side**)

or

| 8. | **Press** | Enter to end the command. |

Offsetting objects by specifying a distance
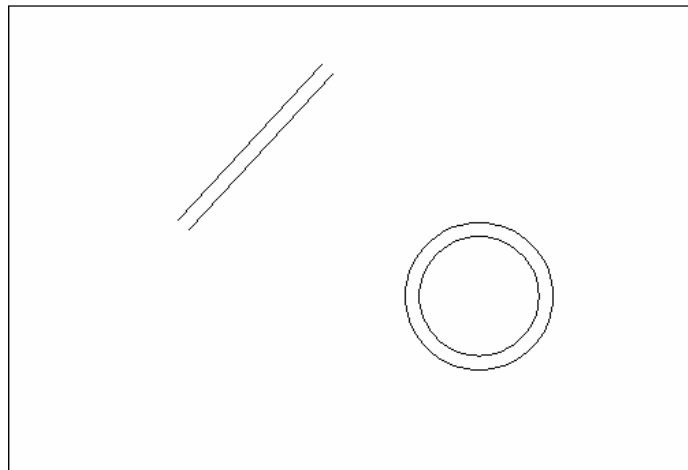
Explode Command
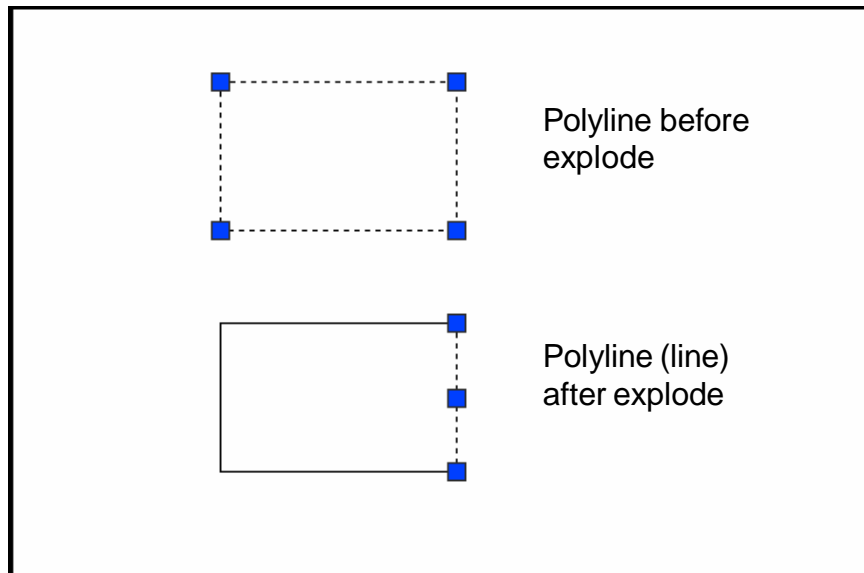
1. **Choose** *Modify, Explode.*

   or

2. **Pick** the Explode icon.

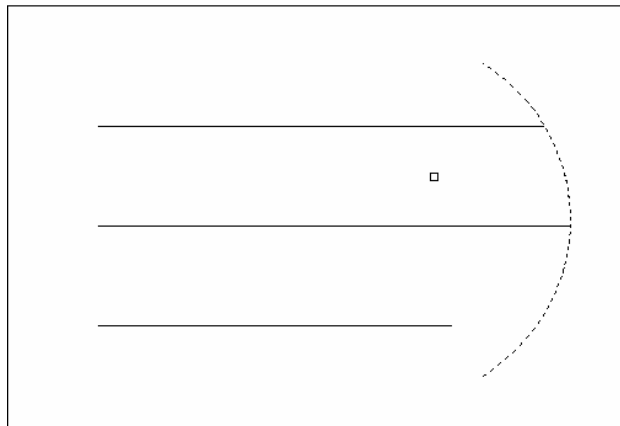3. **Type** EXPLODE at the command prompt.

   Command: **EXPLODE**

   or

4. **Pick** The object to explode. Select objects: (**pick**)

Polyline before explode

Polyline (line) after explode

EXTEND

1. **Choose**   Modify, Extend.

   or

2. **Click**   the Extend icon.

   or

3. **Type**   EXTEND at the command prompt

   Command: **EXTEND**
   Select boundary edge(s)...

4. **Pick**   The BOUNDARY edge to extend to

   Select objects: (**select**)

5. **Press**   ENTER to accept the boundary edge

   Select objects: (**press enter**)

6. **Pick**   The objects to extend

   <Select object to extend> / Project /
   Edge / Undo: Select an object, enter
   an option, or press enter : (**select**)

7. **Press**   ENTER when you are done choosing objects

*Lines Extended
to an Arc
(Arc is boundary edge)*

TIP:

- Use the object selection option FENCE to choose multiple objects

Stretch

1.	**Choose**	Modify, Stretch.
		or
2.	**Click**	the Stretch icon.
3.	**Type**	STRETCH at the command prompt.
		Command : **STRETCH** Select
		objects to stretch by window...
4.	**Type**	C to choose CROSSING window
		Select objects: **C**
5.	**Pick**	A first corner to stretch. First corner: (**point**)
6.	**Pick**	The opposite corner to window the objects to stretch.
		Other corner: (**point**)
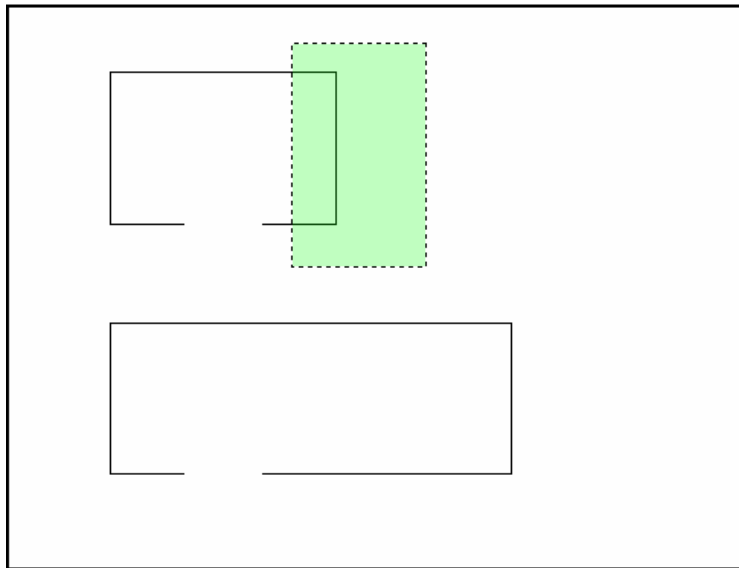
7.	**Press**	ENTER to accept objects to stretch.
8.	**Pick**	A base point to stretch from Base point:
		(**point**)

9. **Pick**   A point to stretch to Newpoint: (**point**)

                      or

10. **Type**   A distance to stretch. Newpoint: **@1<0**


TIP:

The Stretch command must use a CROSSING window or a CROSSING POLYGON window.

TRIM

The TRIM command allows you to trim objects in a drawing so they end precisely at a cutting edge defined by one or more other objects in the drawing.

1. **Choose**   Modify, Trim.

                  or

2. **Click**   the Trim icon.

3. **Type**   TRIM at the command prompt

                  Command: **TRIM**

                  Select cutting edge(s)...

4. **Pick**   The CUTTING edge to extend to

                  Select objects: (**select**)

5. **Press**   ENTER to accept the cutting edge

                  Select objects: (**press enter**)

6. **Pick**   Objects to trim

                  <Select object to trim> / Project / Edge / Undo:
                  Select an object, enter an option, or press enter

7. **Press**   ENTER when you are done choosing objects

                  Select object to trim/Undo: (**press enter**)
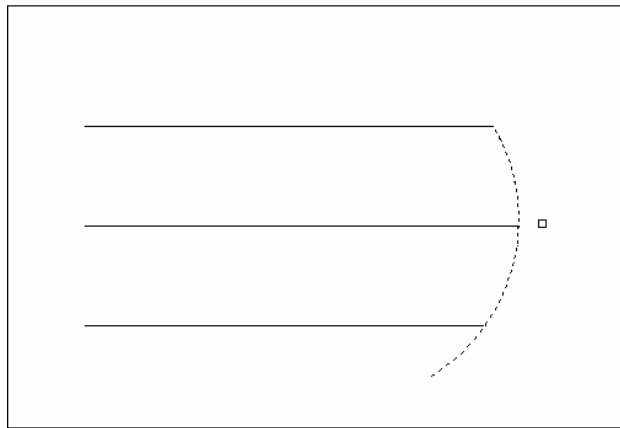
*Lines Trimmed
to an Arc
(Arc is cutting
edge)*

TIP: Hold the SHIFT key to interactively extend instead of trim.

Break

1. **Choose** Modify, Break.

    or

2. **Click** the Break icon.

    or

3. **Type** BREAK at the command prompt. Command: **BREAK**

4. **Pick** Object to break.

    Select object: (**select one object**)

5. **Pick** A second break point.

    Enter second point : (**point**)
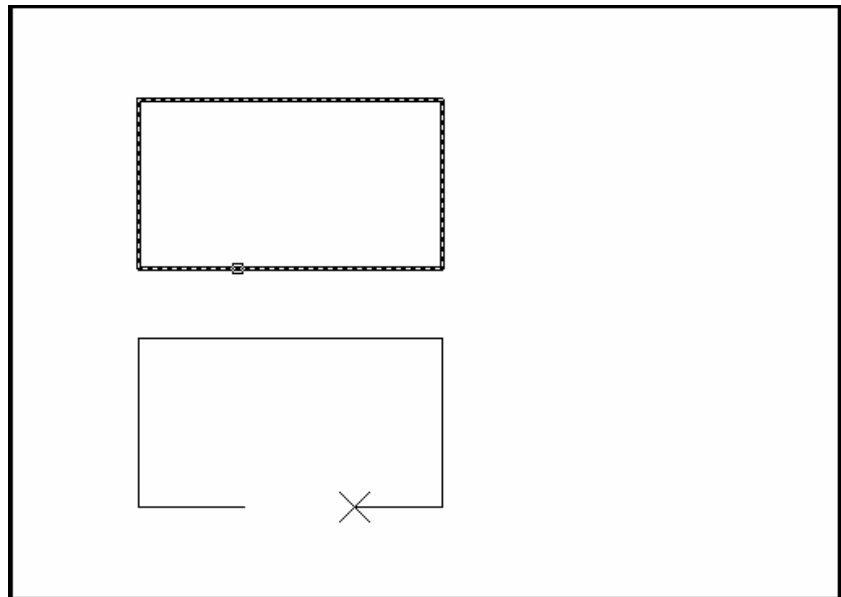
or

6. **Type** **F** to choose a different break point

    Enter second point (or F for first point):(**F**)

MIRROR

1. **Choose**   Modify, Mirror.

                    or

2. **Click**   the Mirror icon.

                    or

3. **Type**   MIRROR at the command prompt.

                    Command: **MIRROR**

4. **Pick**   Objects to mirror.

                    Select objects:(**select**)

5. **Pick**   First point of mirror line: (**point**)

6. **Pick**   Second point: (**point**)

7. **Type**   Yes to delete the original objects and
                    No to keep them.

                    Delete old objects? **Y** or **N**

Mirror Line
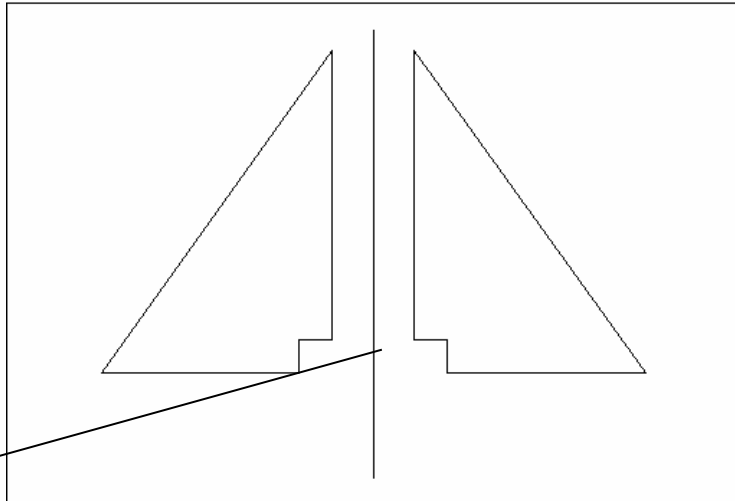
ROTATE

1. **Choose**   Modify, Rotate.

     or

2. **Click**   the Modify icon. ↻

     or

3. **Type**   ROTATE at the command prompt

     Command : **ROTATE**

4. **Pick**   Objects to rotate:

     Select objects:(**select**)

5. **Pick**   A pivot point to rotate around

     Base point: (**point**)

6. **Type**   A rotation angle<Rotation angle>/Reference:
             (**number**)

     or

7. **Pick**   A rotation angle<Rotation angle>/Reference: (**point**)
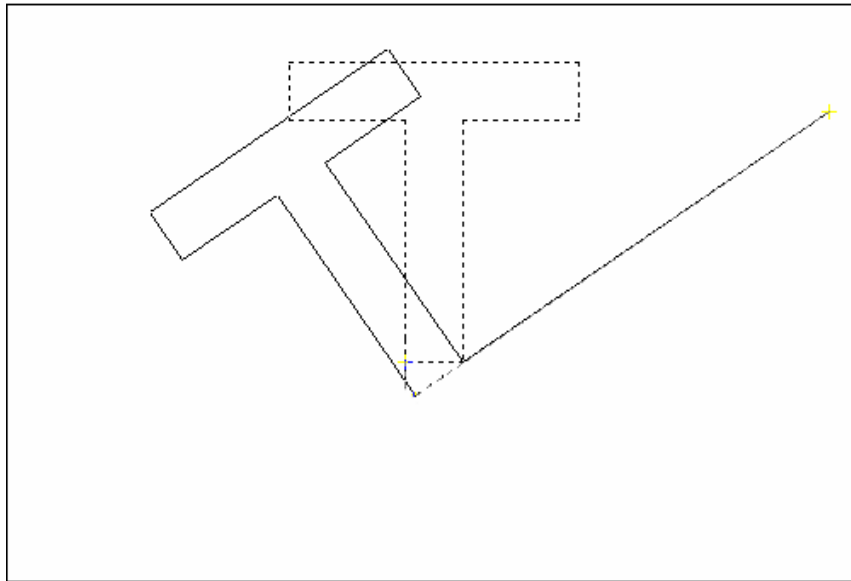
SCALE

1. **Choose**   Modify, Scale.

          or

2. **Click**   the Scale icon. 🔲

          or

3. **Type**   SCALE at the command prompt

          Command: **SCALE**

          Select objects: (**select objects**)

4. **Pick**   A pivot point to scale about Base point: (**point**)

5. **Type**   A rotation angle<Scale factor>/Reference:(**number**)

          or

6. **Pick**   A scale factor<Scale factor>/Reference:
          (**point**)

          Scale factor/Reference: (**points**)
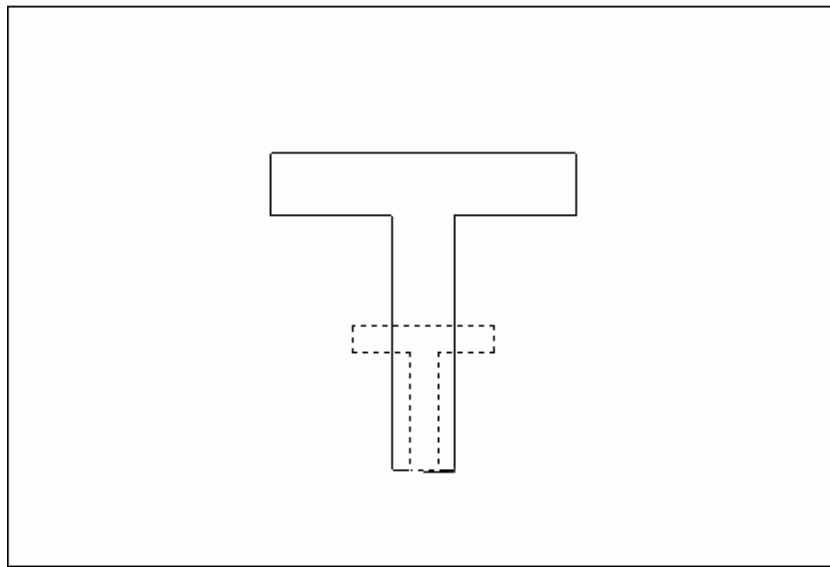
Text Command

Text

Creates a single-line text object

1. **Type**   TEXT at the command prompt

    Command: **TEXT**

    > **or**

2. **Pick**   the Single Line Text icon from the Text Toolbar. AᴵI

3. **Pick**   A start point

    Justify/Style/<Start Point>: (**point**)

    > **or**

4. **Type**   J to change the justification or S to change the text style.

5. **Type**   A text height

    Height <default>: (**type value or pick two points**)

6. **Type**   A rotation angle

    Rotation angle <default>: (**angle or point**)

7. **Type**   A text string

    Text: (**type text string**)

8. **Press**   enter to exit the Text: prompt.

DTEXT (Dynamic Text)

Creates a single-line text object, showing the text dynamically on the screen as it is entered.

1. **Choose**   Draw, Text, Single Line Text.

    > **or**

2. **Type**   DTEXT at the command prompt

    Command : **DTEXT**

3. **Follow**   the steps 3-8 from above.

Layers

Introduction to Layers and Layer Dialog Box

1. **Choose**   Format, Layer.

           or

2. **Type**   LAYER at the command prompt.

    Command: **LAYER (or LA)**

           or

3. **Pick**   the layers icon from the Layer Control box
    on the object properties toolbar.

AutoCAD 2005

Layer Properties
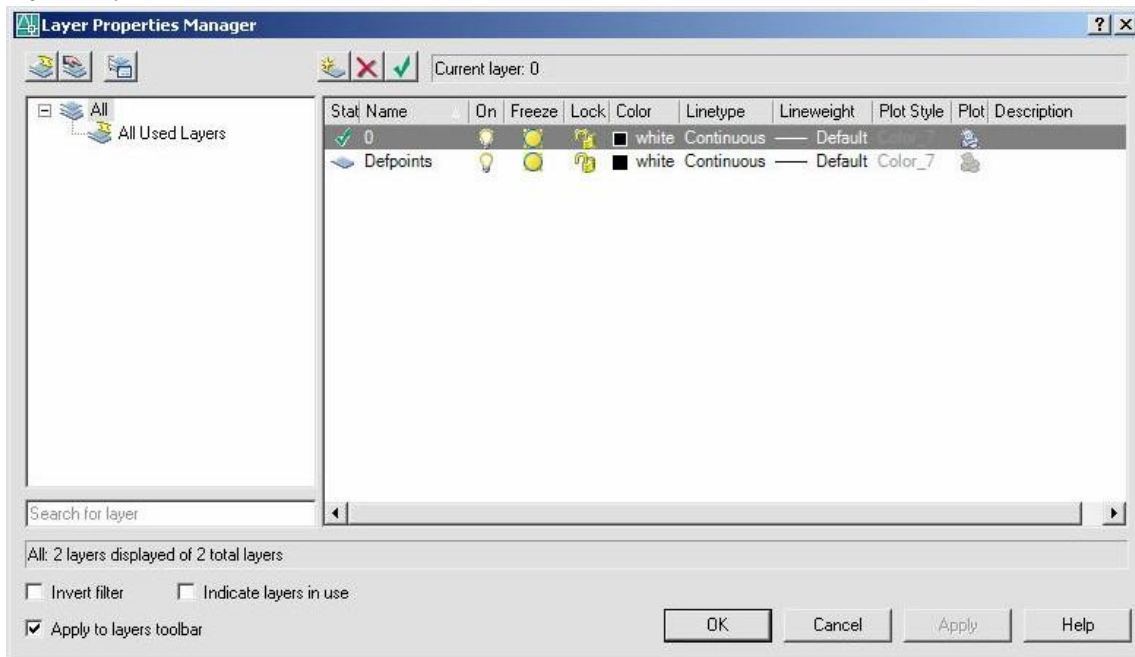
Layer Options

?	Lists layers, with states, colors and linetypes.
Make	Creates a new layer and makes it current.
Set	Sets current layer.
New	Creates new layers .
ON	Turns on specified layers.
OFF	Turns off specified layers.
Color	Assigns color to specified layers.
Ltype	Assigns linetype to specified layers.
Freeze	Completely ignores layers during regeneration.
Thaw	Unfreezes specified layers Ltype.
Lock	Makes a layer read only preventing entities from being edited but available visual reference and osnap functions.
Unlock	Places a layer in read write mode and available for edits.
Plot	Turns a Layer On for Plotting
No Plot	Turns a Layer Off for Plotting
LWeight	Controls the line weight for each layer

TIP:

Layers can be set using the command line prompts for layers. To use this, type –LAYER or -LA at the command prompt

1. **Type**   Command: -**LAYER** or **L A**

2. **Type**   One of the following layer options

?/Make/Set/New/ON/OFF/Color/Ltype/Freeze/Thaw:

Layer Shortcuts

Changing the Layer of an Object

1. **Click** Once on the object to change.

2. **Select** the desired layer from the Layer Control Box dropdown.

   AutoCAD will move the object to the new layer.

Select layer

Select object first
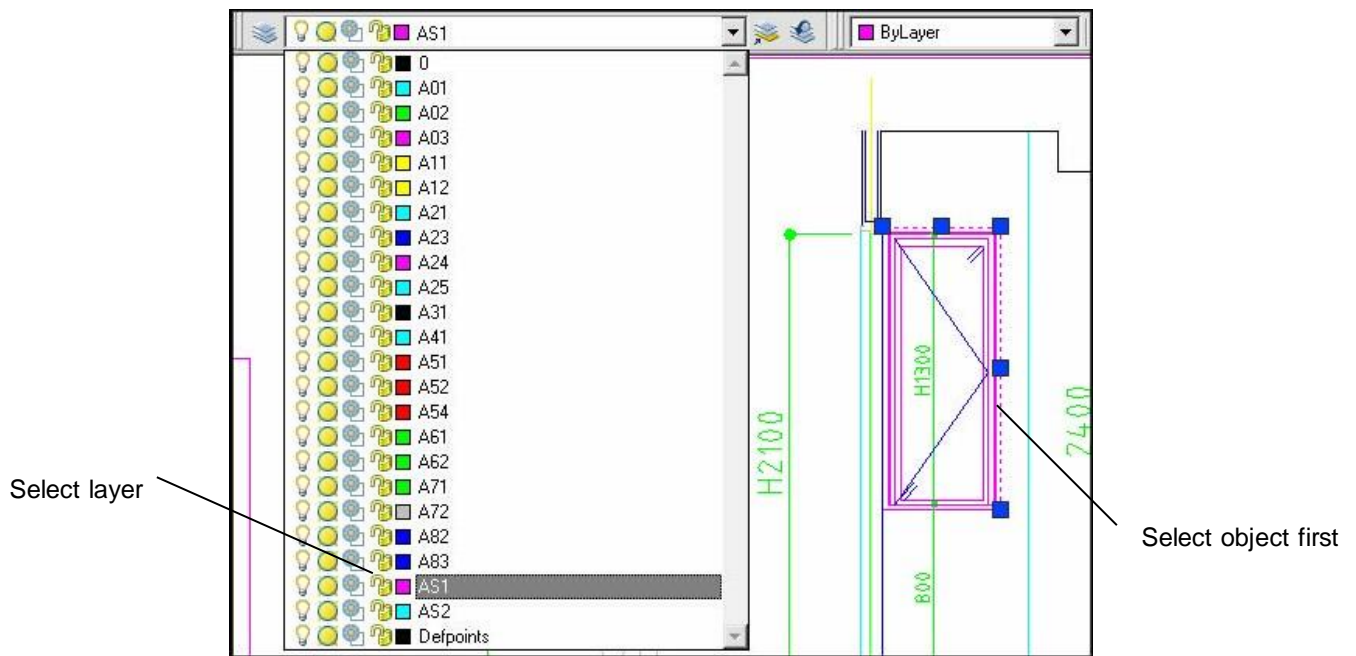
Colours + Line Weights

Color Command

    1.   **Choose**   Format, Color.

                    or

    2.   **Type**   DDCOLOR at the command prompt.

                Command: **DDCOLOR or COL**

                    or

    3.   **Choose**   Color on the Object Properties toolbar and then select a color from the list or select Other to display the Select Color dialog box.
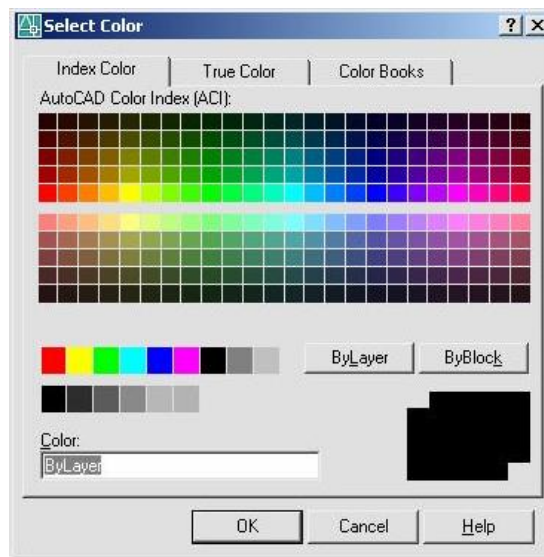
TIP:

These settings ignore the current layer settings for color.

By Layer

    If you enter bylayer, new objects assume the color of the layer upon which they are drawn.

By Block

    If you enter byblock, AutoCAD draws new objects in the default color (white or black, depending on your configuration) until they are grouped into a block. When the block is inserted in the drawing, the objects in the block inherit the current setting of the COLOR command.

Linetypes

Loading and Changing Linetypes

1. **Choose**   Format, Linetype...

     or

2. **Type**   DDLTYPE at the command prompt.

     Command:**DDLTYPE or LT**

3. **Choose**   Load... to see a list of available linetypes.

4. **Choose**   the desired linetype to assign.
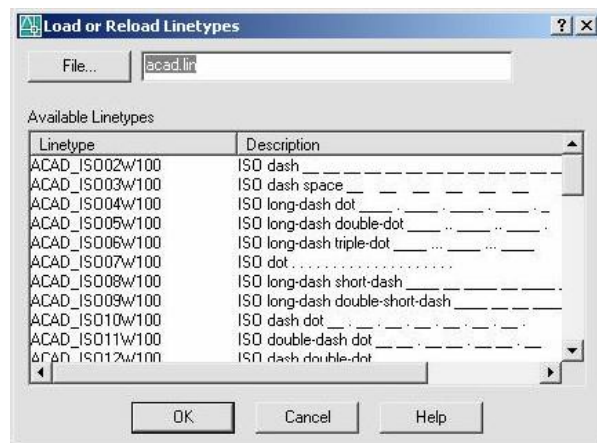
5. **Click**   OK.

Lineweights

Loading and Changing Lineweights

1. **Choose**   Format, Lineweight...

   or

2. **Type**   LINEWEIGHT at the command prompt.

   Command: **LINEWEIGHT or LWEIGHT**

   or

4. **Pick**   a lineweight to make current from the Object
   Properties menu.
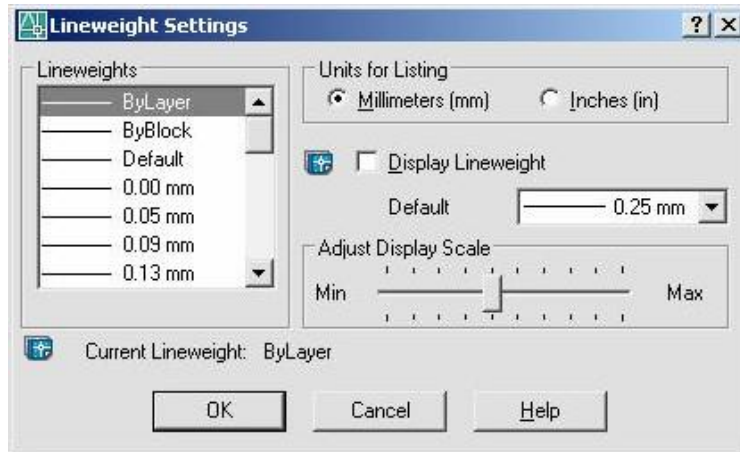
TIPS:

- Lineweights can also be assigned to layers.

- The Display Lineweights feature can be turned on/off on the status bar to
  show or not show lineweights in the drawing, thus making regenerations
  faster.
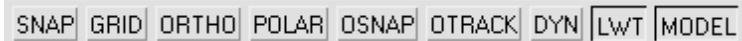
- Lineweights are displayed using a pixel width in proportion to the real-
  world unit value at which they plot. If you are using a high-resolution
  monitor, you can adjust the lineweight display scale to better display
  different lineweight widths.

Object Properties

1. **Choose** Modify, Properties.

   or

2. **Click** the Properties icon.

   or

3. **Type** DDCHPROP or DDMODIFY at the command prompt.

   Command: **DDCHPROP** (CH) or
   DDMODIFY (MO)

4. **Pick** Objects whose properties you want to change
   Pick a window for DDCHPROP, single object
   for DDMODIFY.

   Select objects:(select)

5. **Press** ENTER to accept objects.

   Select objects: (press enter)

6. **Choose** One of the following properties to change.
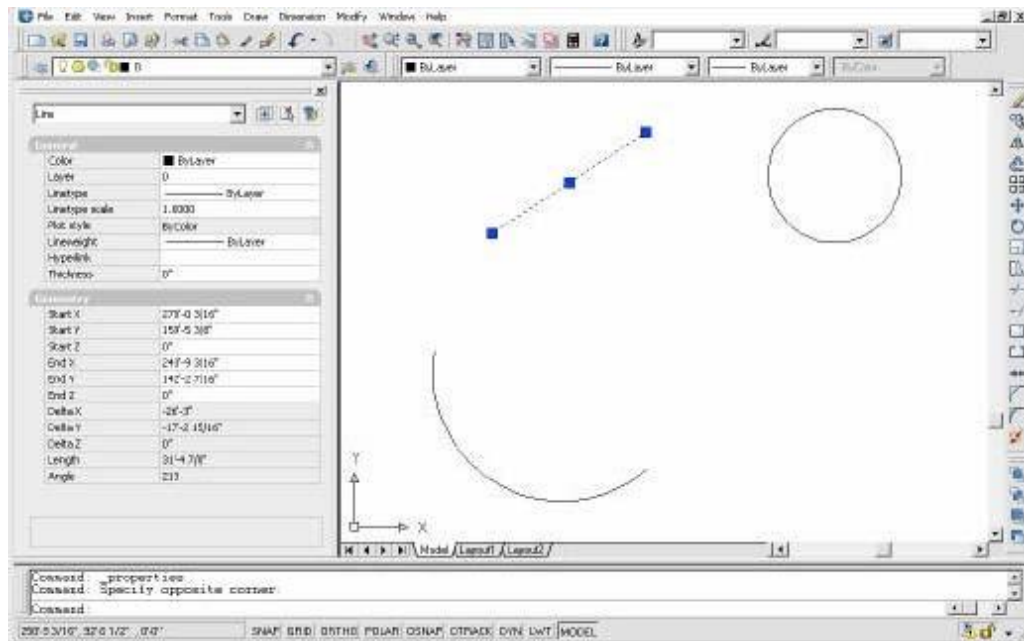
Other Useful Functions

BHATCH Command

1. **Choose**   Draw, Hatch...

   or

2. **Click**   the Hatch icon.   ⊞

   or

3. **Type**   BHATCH at the command prompt

   Command: **BHATCH**
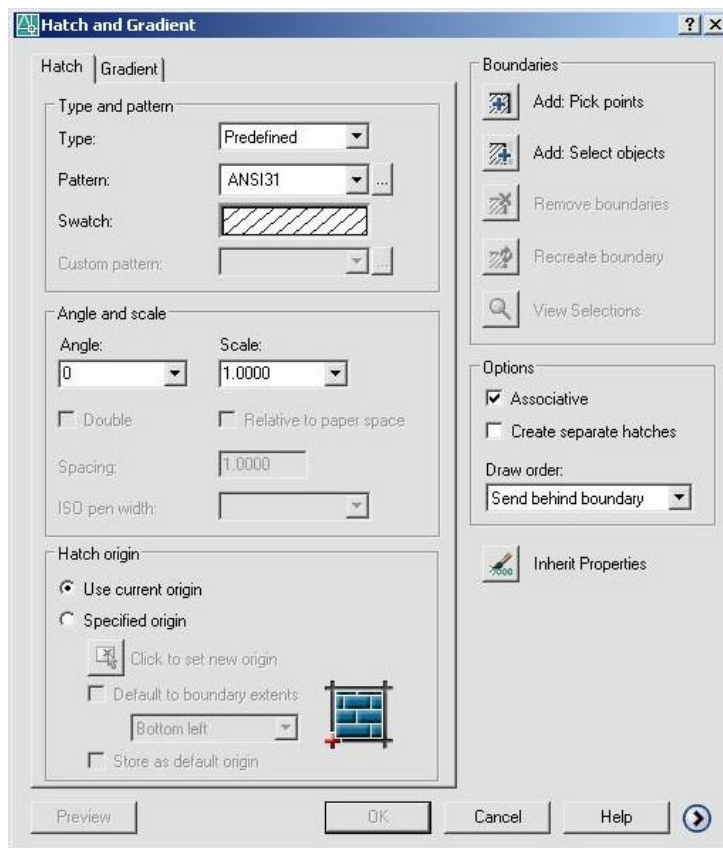
AutoCAD 2D Tutorial

Measuring Distances

1. **Choose**   Tools, Inquiry, Distance.

   or

2. **Click**   the Distance icon from the Inquiry Toolbar.

   or

3. **Type**   DIST at the command prompt

   Command: **DIST**

4. **Pick**   The first point to measure from

   First point: **pick point**

5. **Pick**   The second point to measure to

   Second point: **pick point**

Distance Between Circle Centers
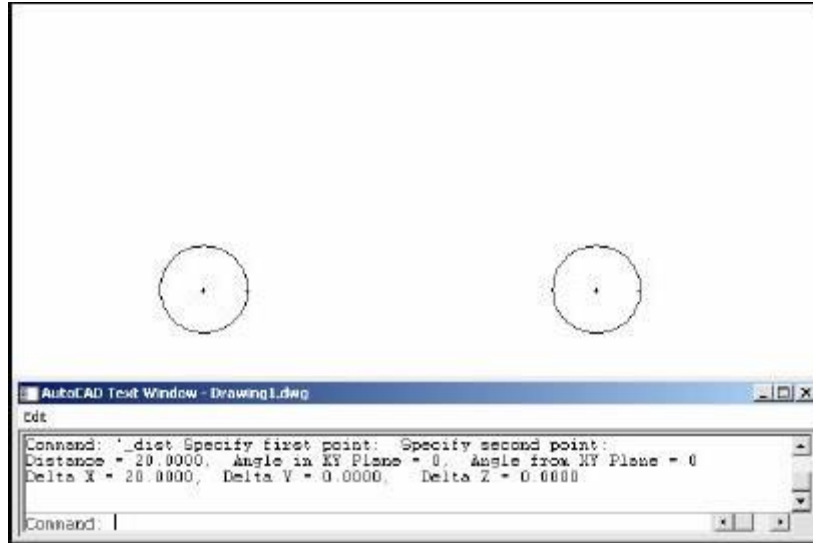
TIP:

Be sure to use Object Snaps with the MEASURE command.

Linear Dimensions

1. . **Choose** Dimension, Linear.

   or

2. . **Click** the Linear Dimension command from the toolbar.

   or

3. . **Type** DIM at the command prompt.

   Command: **DIM**

   Dim: HOR or VER
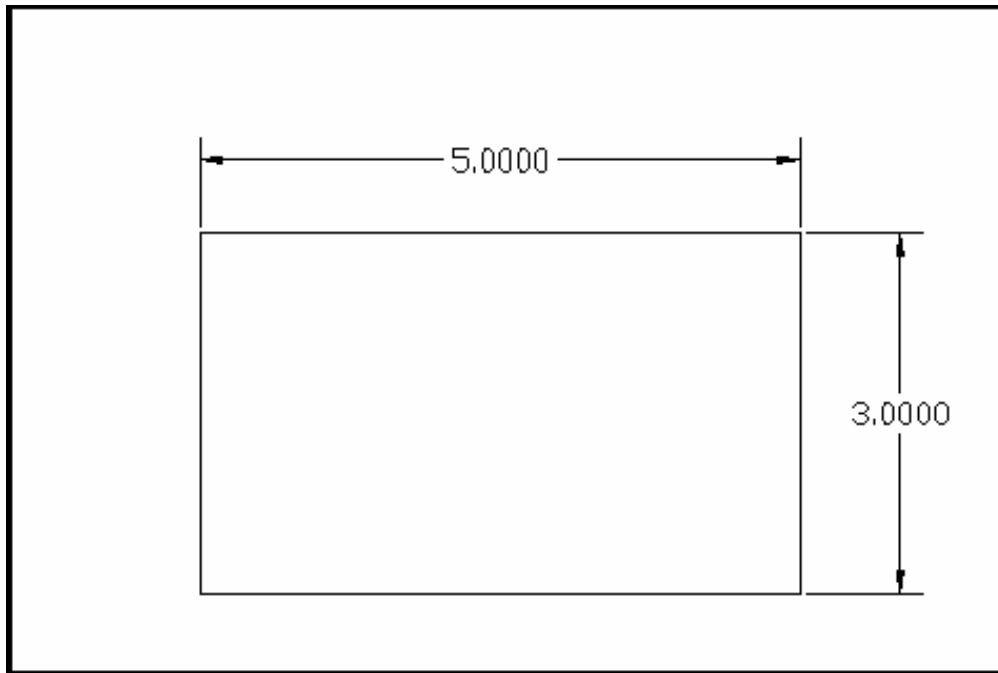
Aligned Dimensions

1. . **Choose** Dimension, Aligned.

   or

2. . **Click** the Aligned Dimension command from the toolbar.

   or
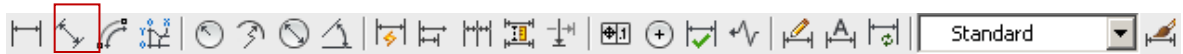
3. . **Type** DIM at the command prompt.

   Command: **DIM**

   Dim: **ALIGNED**
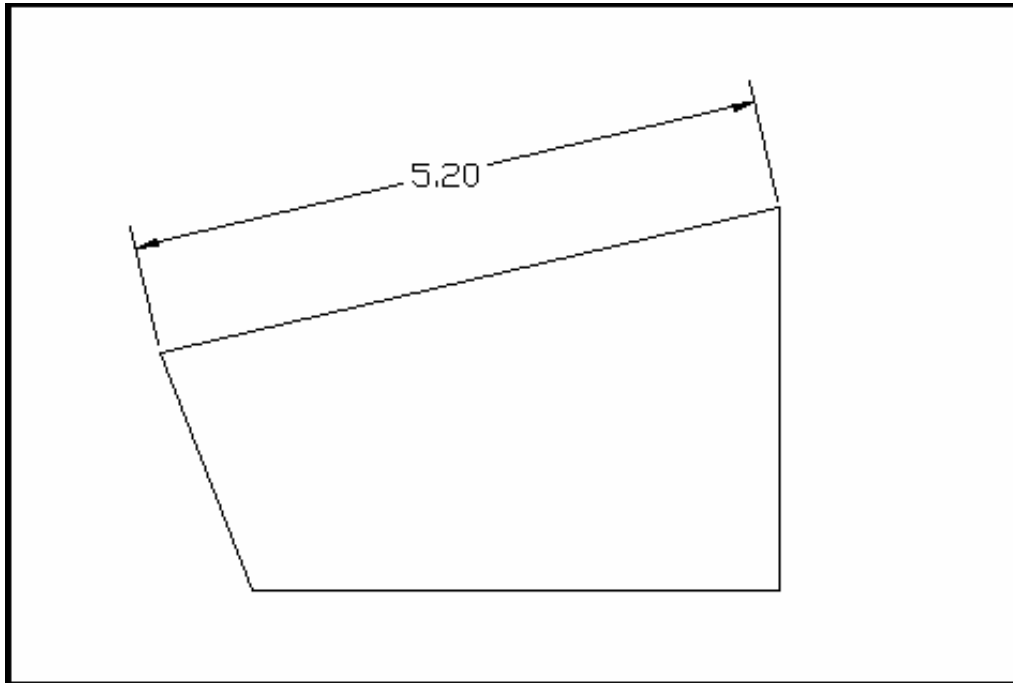
Radial Dimensions

1.   .   **Choose**   Dimension, Radius or Diameter.

                                  or

2.   .   **Click** the Radial Dimensions command
from the toolbar.

                                  or

3.   .   **Type** DIM at the command prompt.

Command: **DIM**

Dim: **RADIUS or DIAMETER**
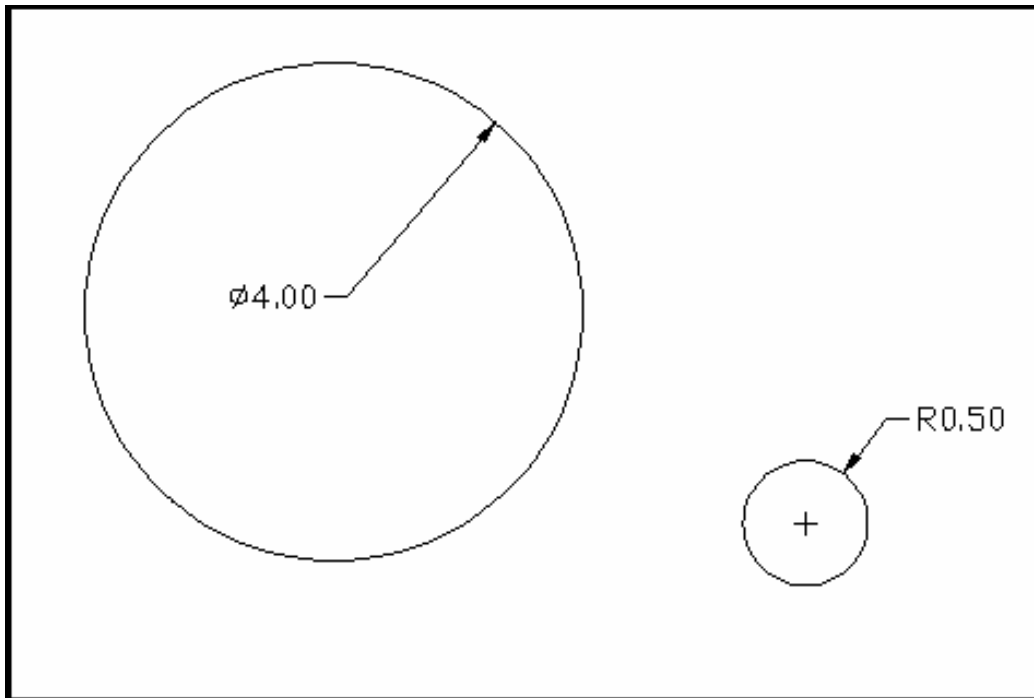
Calculating Areas

1. **Choose**   Tools, Inquiry, Area.

    or

2. **Click**   the Area icon.

    or

3. **Type**   AREA at the command prompt

    Command: **AREA**

4. **Pick**   The first point for area calculation

    <First point>/Object/Add/Subtract: **pick**

5. **Pick**   Next point: **pick**

6. **Pick**   Next point: **pick**

7. **Press**   ENTER when you are finished choosing points.

    Area of Rectangle
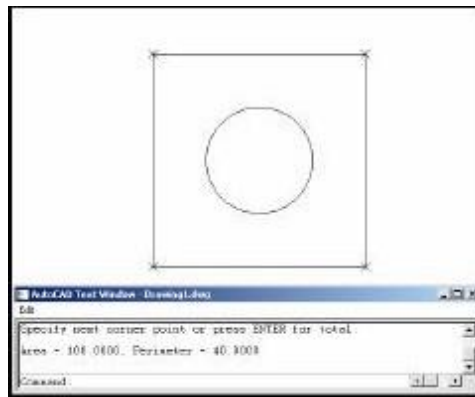
Object	Allows user to pick an object to calculate area (circle or polyline).
Add	Adds separate areas for a total area calculation
Subtract	Subtracts areas from each other.

TIPS:

Be sure to use Object Snaps with the MEASURE command

To subtract an area, you must first be in "add" mode to add the first area.

AutoCAD 2D Tutorial

Plot Settings

1. **Choose** the Plot Settings tab.

2. **Choose** the appropriate paper size based on the chosen plotter.

3. **Choose** the paper units (inches or mm).

4. **Choose** the drawing orientation (Portrait, Landscape, Upside down).

5. **Choose** the plotting area.

6. **Choose** the plot scale.

7. **Choose** plot to center or specify an x or y offset.

8. **Click** OK.
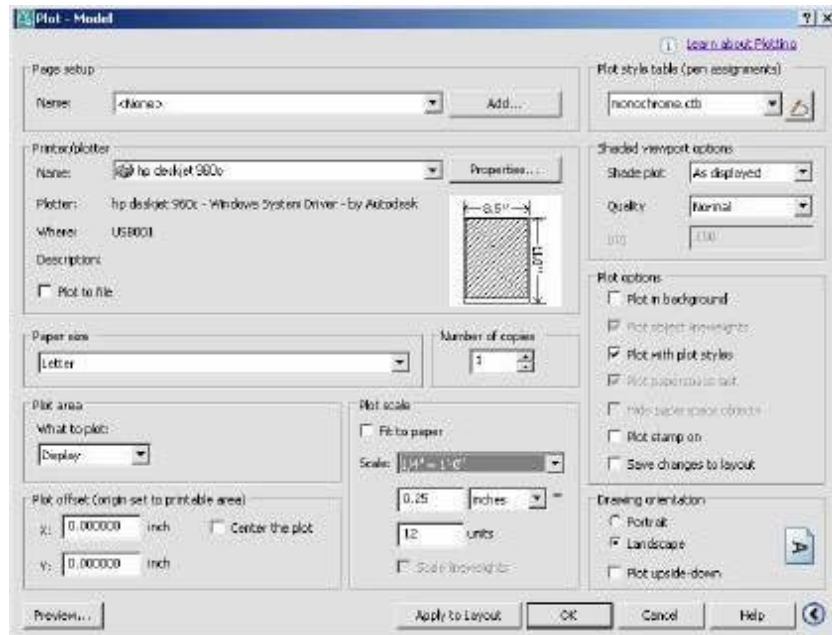
EXERCISES

Auto CAD

Exercise – 1

Aim : To create a 2D view of the given diagram using Auto CAD.

Procedure:

1. Type limits in command menu & set value to 297,290.

2. Change the units to millimeters from inches and also precision to

   0 by clicking format -> units ->ok.

3. To set the paper size type zoom -> enter and type a -> enter in

   Command bar.

4 . Draw the 3 concentric circles with diameters 94, 74 & 54

5 .Draw the two axis lines from centre of circles

6 .Draw the vertical line from the centre of circle

7 .From the modify tool bar, use the array command to draw the 6holes with

   12dia from centre of circles

8. Now draw the 30^0 line by use the vertical line

9. Then mirror the 30^0 line, with vertical line

10. Again draw the concentric of radius 100 from centre of circle

11. From the modify toolbar, use the offset command to draw the 12 & 23

    distance circle.

12. Draw 2 circles. With radius 23 & 12 on the 100R circle where the 30^0

    line co-inside.

13. . From modify toolbar, mirror these circle to represent the another side.

14 . And offset vertical line from centre of circle with a distance both side of

    vertical line.

15. . From modify toolbar, use the fillet command to represent fillet of

radius 10 &9 to the offset line.

16. . Trim the unwanted lines to get required 2D drawing

Result: Hence the required 2D diagram is created using Auto CAD.

Viva Questions

1. What is CAD?
2. What is the difference between Pan and Zoom?
3. What is the difference between line and spline?
4. What is the difference between chamfer and fillet?
5. By how many ways can you draw a circle?

Exercise – 2

Aim: To create a 2D view of the given diagram using Auto CAD.

Procedure:

1. Type limits in command menu & set values to 200,200.
2. Change the units to millimeters from inches and also precision to 0 by clicking format -> units -> ok.
3. To set the paper size type zoom -> enter and type a -> enter in command bar
4. Draw 2 lines as the axes and draw concentric circles of specified diameter.
5. Draw a ray of 30^0 angle to the +ve Y axis as shown in the figure and a ray of angle 60^0 to the –ve Y axis as shown in the figure.
6. Draw concentric circles from the point where the circle meets the positive Y axis as show.
7. Now trim the circles to get appropriate shape.
8. Continue with the design until the AutoCAD drawing his complete.
9. Give the dimensions from the dimension tool bar as in diagram.
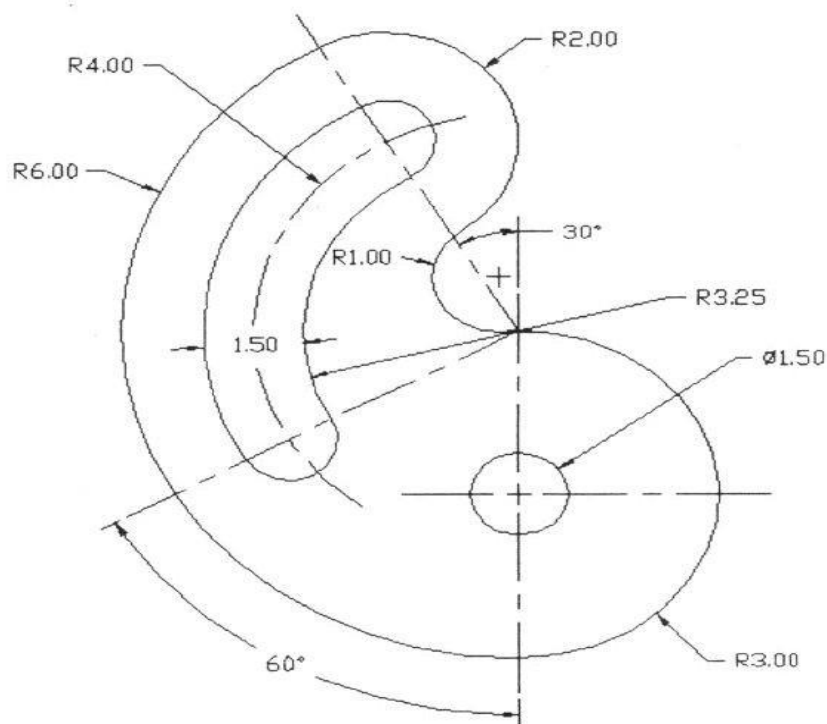
Result: Hence the required 2D diagram is created using Auto CAD.

Viva Questions

1. What is the difference between line and Spline?
2. What is the difference between chamfer and fillet?
3. What are different ways to draw a circle?
4. What are the possible ways to draw an arc?
5. How to extend a line?
6. What is the procedure to enter into AutoCAD?

Exercise – 3

Aim: To create a 2D view of the given diagram using Auto CAD.

Procedure:

1. Type limits in command menu & set values to 45,45
2. Change the units to millimeters from inches and also precision to 0 by clicking format -> units -> ok.
3. To set the paper size type zoom -> enter and type a -> enter in command bar
4. Draw the 3 concentric circles of diameters 85 ,62,32
5. Draw the 2 axes lines from the centre of the circles
6. Draw the circle with 14dia on 62dia of circle and offset of the vertical line with distance 4 to both sides of the vertical line
7. Then trim the unwanted lines
8. Use the array command from modify tool bar to represent the 6 holes with 14 dia of centre of the circles
9. Offset the vertical and horizontal axes with 47 and 52 distance
10. And draw the 2 circles with 14 radius and 12 dia at coincide of the offset axes
11. From the modify tool bar select the fillet command to represent the 12R fillet
12. Then mirror this to require the 2D drawing
13. Finally trim the unwanted lines and circles

Cover

Result: Hence the required 2D diagram is created using Auto CAD.

Viva Questions

1. What are the possible ways to draw arc?
2. How to extend line?
3. What is the purpose of command trim?
4. How to convert 2D drawings to 3D drawings?
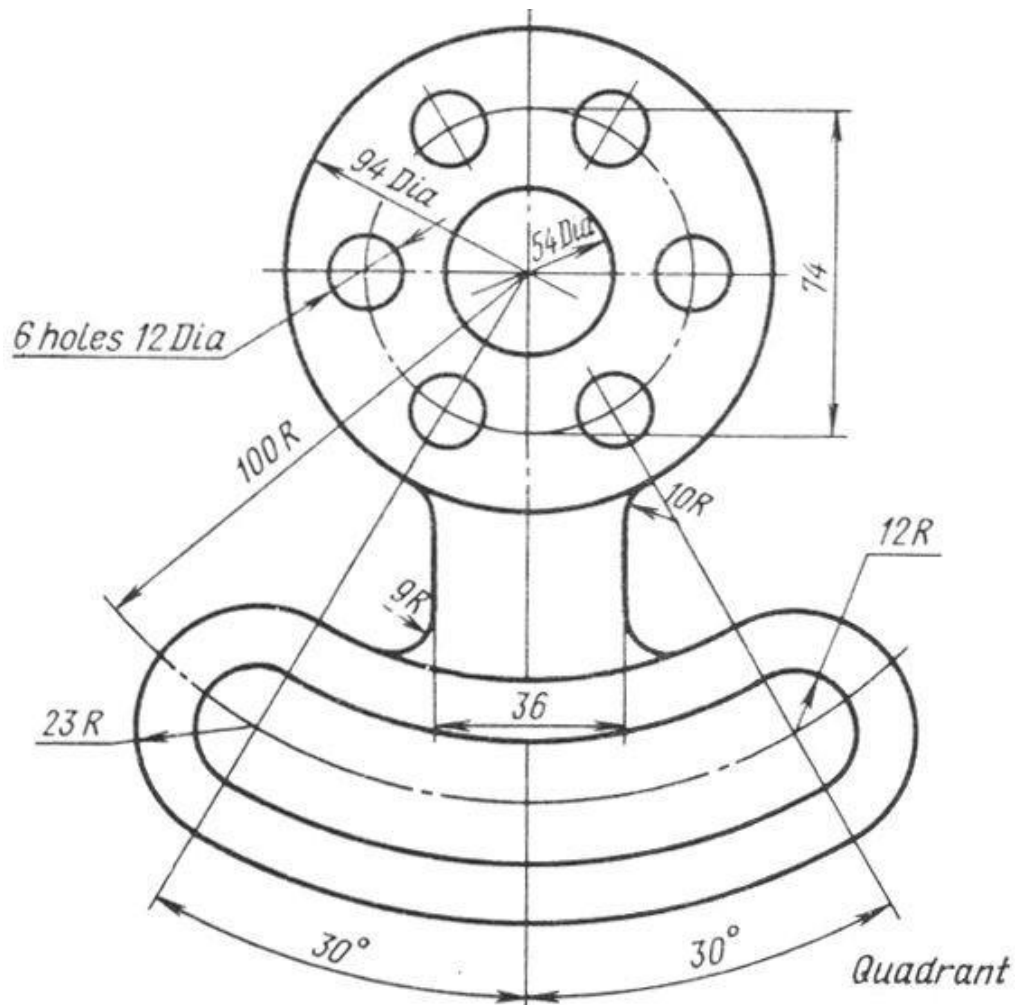5. How to give dimension?

Exercise – 4

Aim: To create a 2D view of the given diagram using Auto CAD.

Procedure:

1. Type limits in command menu & set value to 297,290.

2. Change the units to millimeters from inches and also precision to 0 by clicking format -> units -> ok.

3. To set the paper size type zoom -> enter and type a -> enter in Command bar.

4. Draw the 2 axes lines

5. Draw 2 concentric circles of diameter 58 and 40 above the axes

6. Draw the 10dia circle on the 40dia of the circle

7. And use the array command from modify tool bar to represent the 8 holes with 10dia from centre of the circles.

8. Draw the 2 concentric circles of diameter 58 & 36 below the axes

9. Draw the circles of the diameter 8 on the circle of 36dia

10. Use the array command from the modify tool bar to represent the 6 holes with 8dia

11. Draw the 2 concentric circles of diameter 22 and 20 radius at the right side of the vertical line from the vertical axes.

12. Fillet the circles of radius 20 with 15 radiuses.

13. And again draw the circles of diameter 16& 20R at left side of the vertical line from the vertical axes.

14. And chamfer the circles of radius 20 with 58dia circle

15. Then trim the unwanted lines to get the required 2D drawing.

58

8 holes 10 Dia

40 Dia

15 R

20 R

16

34

22

58 Dia

34

20 R

36 Dia

6 holes 8 Dia

40

40

Housing
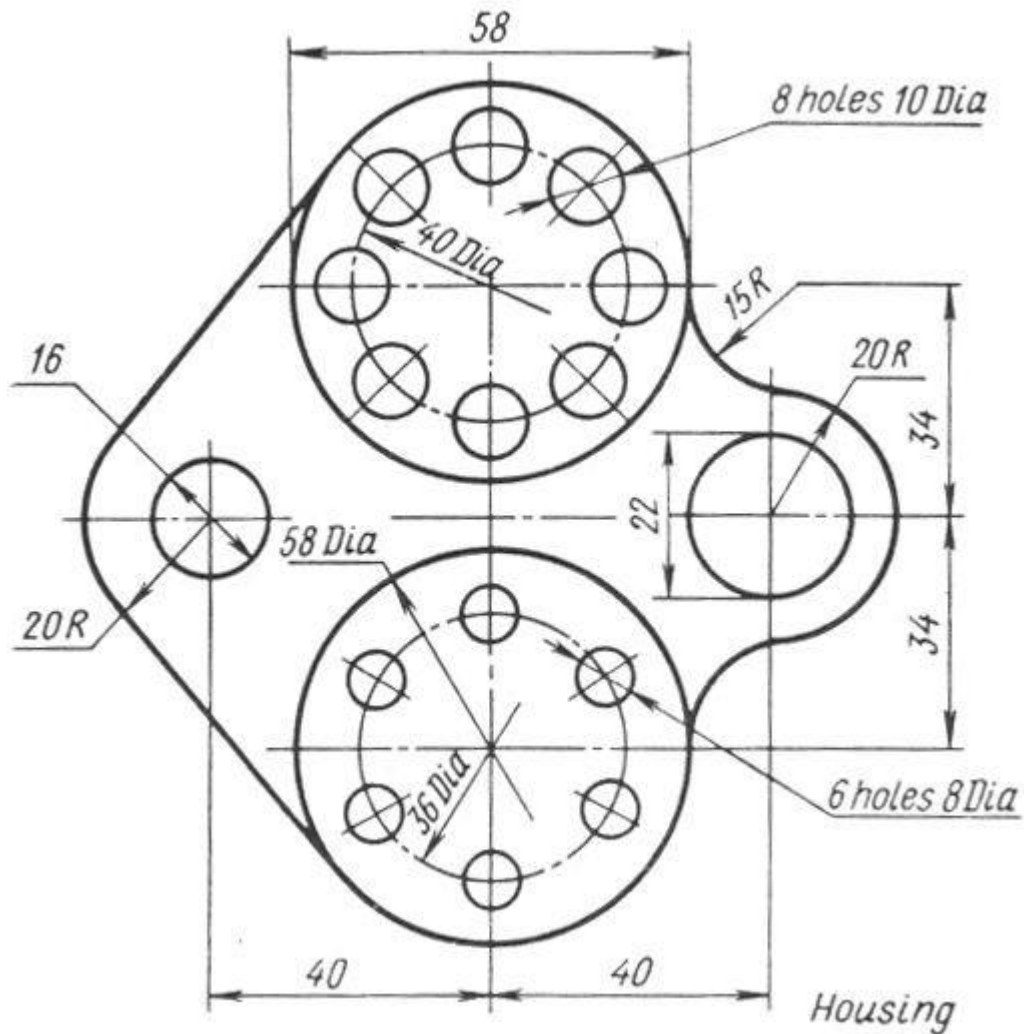
Result: Hence the required 2D diagram is created using Auto CAD.

Viva questions

1. What is the purpose of command trim?
2. How to convert 2D drawings to 3D drawings?
3. What is the difference between Pan and Zoom?
4. What is difference between circle and ellipse?
5. What is the difference between rectangle and polygon?

Exercise – 5

Aim: To create a 2D isometric view of the given diagram using Auto CAD.

Procedure:

1. Type limits in command menu & set value to 297,290.
2. Change the units to millimeters from inches and also precision to 0 by clicking format -> units -> ok.
3. To set the paper size type zoom -> enter and type a -> enter in command bar.
4. Go to drafting settings and turn on isometric snap..
5. Use the F5 key to change between the views of isometric planes.
6. Start from the front view and draw the the line of length of line 104 using the F8 key (O snap key) and continue with the 48 length line.
7. Change to top plane and draw the 72mm line.
8. Continue in the same fashion to complete the whole figure.
9. Give the dimensions from the dimension tool bar as in diagram.

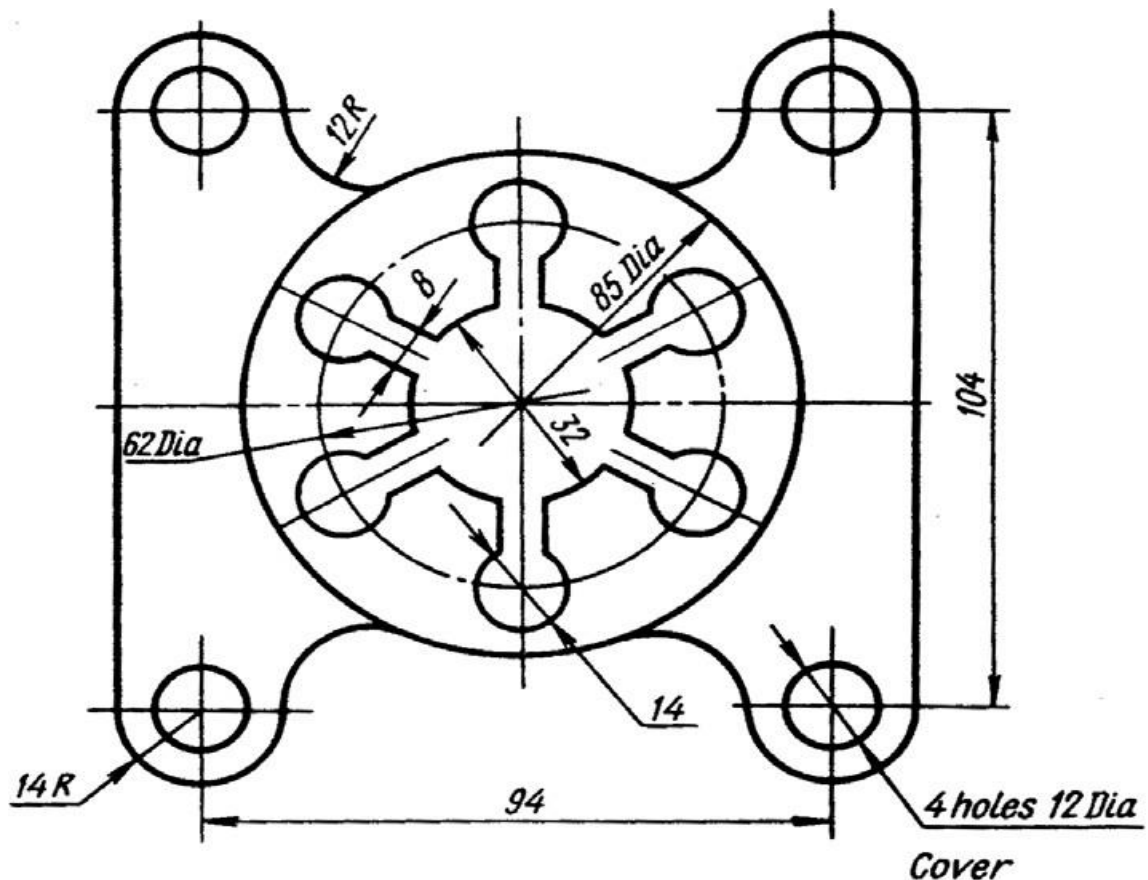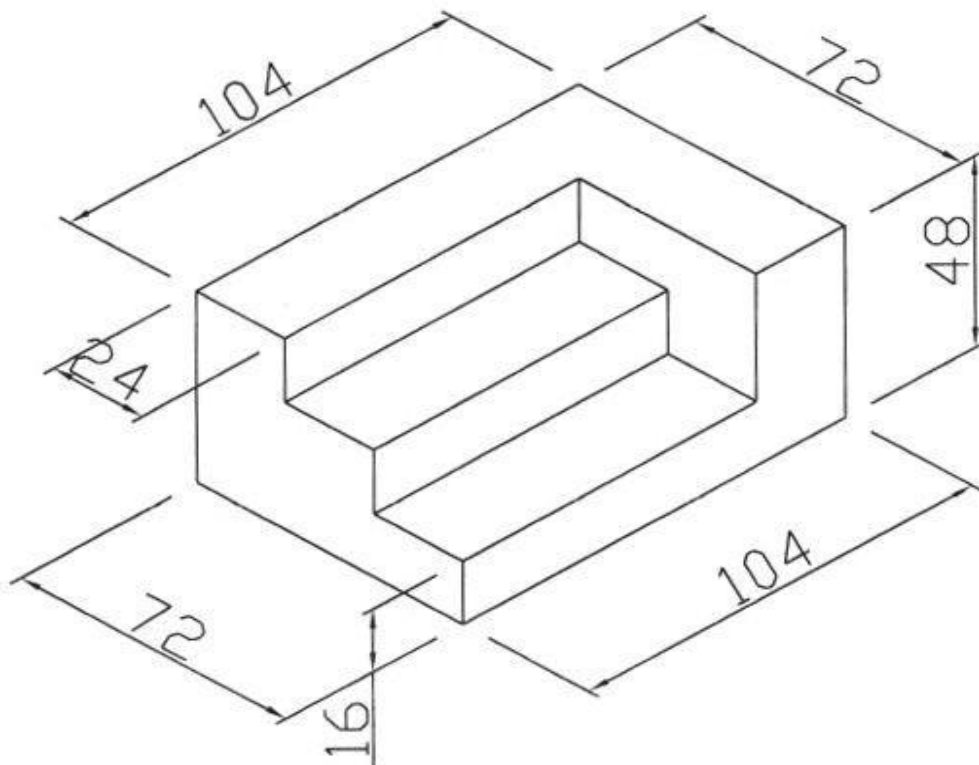**Result:** Hence the required 2D isometric diagram is created using Auto CAD.

Viva questions

1. What is the difference between metric unit and English unit?
2. What is the shortcut key for Ortho ON/OFF ?
3. What is the shortcut key for help?
4. What are the various ways to draw a measured line?
5. .What are object snap command.

Use AutoCAD Solid Modeling to create a 3D view drawing of each the objects shown bellow.

3D1

3D2

R30 R10

30 20

40

80

20

15

20

60

25

15

15

40

22

30

30

80

60
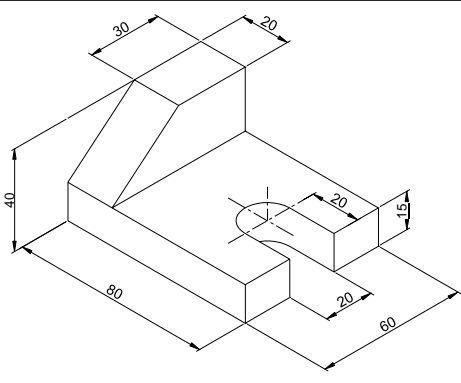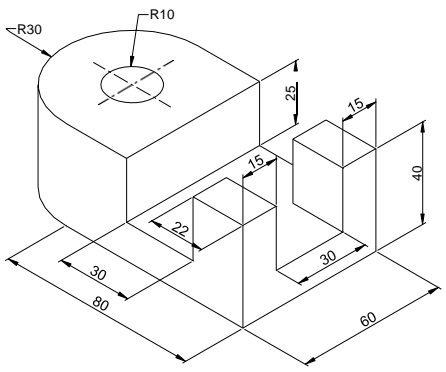
3D1 & 2

Use AutoCAD Solid Modeling to create a 3D view of the object shown bellow.

R20

45

45

15

30

15

30

90

120
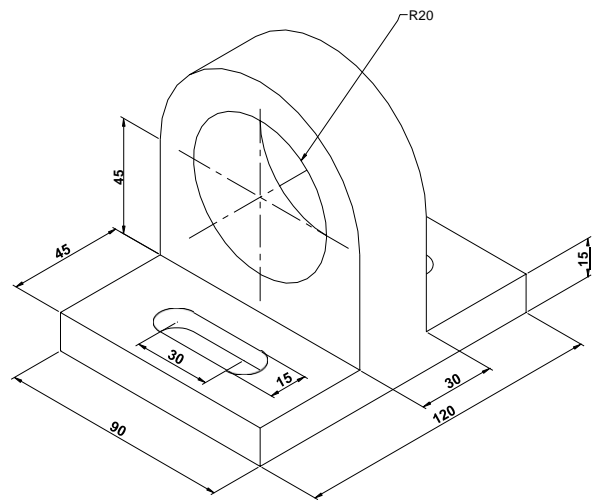
3D3

Use Solid Modeling to create a 3D view of each object shown below.
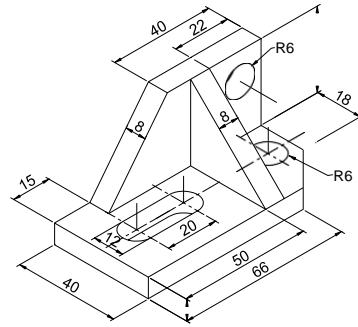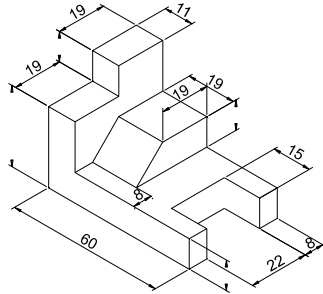
DRAW A SOLID MODEL OF EACH
OBJECT FROM THE GIVEN
ISOMETRIC VIEWS BELLOW.
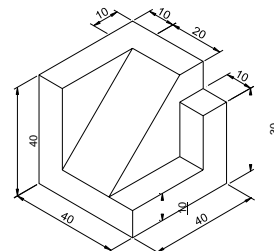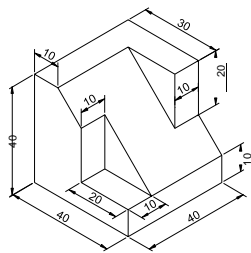
1.   Cotter joint with sleeve

Aim : To draw the cotter joint with sleeve using Auto CAD.
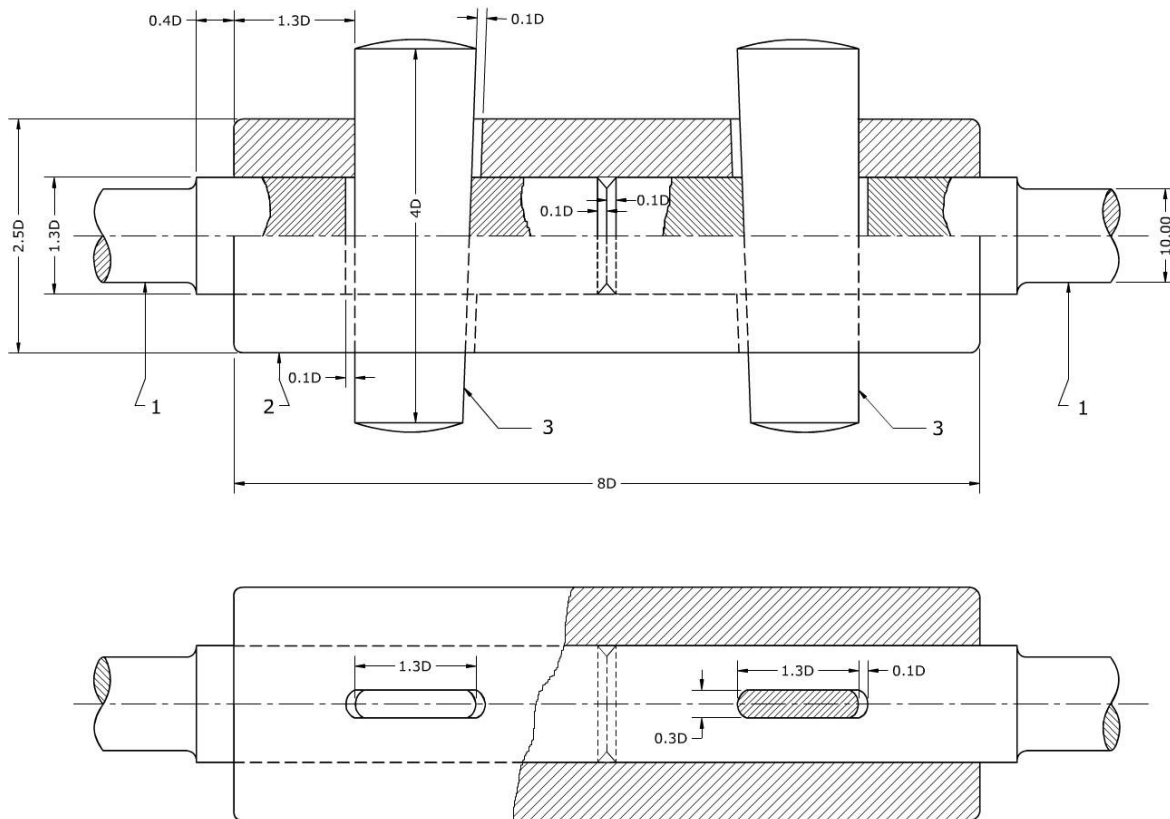
1 - Circular rods
2 - Sleeve with Slots
3 - Cotters

Procedure

1. Set limits of Auto CAD screen. Set units   Type : Decimal, Insertion scale : Millimetres
2. Insert line types Centre line and Dashed line into the drawing using Linetype command.

3. Draw the centre line. Draw the two shafts by taking diameter of the shaft as 30mm and increasing the diameter to 1.3D inside the sleeve as shown in the figure. Use line command and spline command for drawing cut sections of the rods at the ends.

4. Draw a sleeve over the rods by taking diameter as 2.5D and length as 8D. using trim command remove required portion of the sleeve and rods to insert cotters. Cotter length is 4D, width 1.3D and taper is 1:30.

5. Represent the top half in section by applying hatching using hatch command. Represent invisible portion of the rods and cotters in the sleeve with dashed lines.

6. Drawing the projections from the front view draw the top view using line, arc or circle, fillet and trim commands.

7. Create a new layer using layer command and set color for layer to display dimensions. Name this layer as Dim

8. Create a new dimension style. Draw all dimensions of the drawing in Dim layer.

Precautions

1. Use zoom and Pan Commands properly while doing trim and fillet operations at very small dimensions.

2. Use line type scale command(lts) for correct display of dashed and center lines.

3. Use hatchedit command to adjust the hatching of the sections.

4. Draw all the dimensions in new layer only.

Result

Cotter joint with sleeve has been drawn successfully using Auto CAD software.

2. Knuckle Joint

Aim : To draw the Knuckle using Auto CAD.
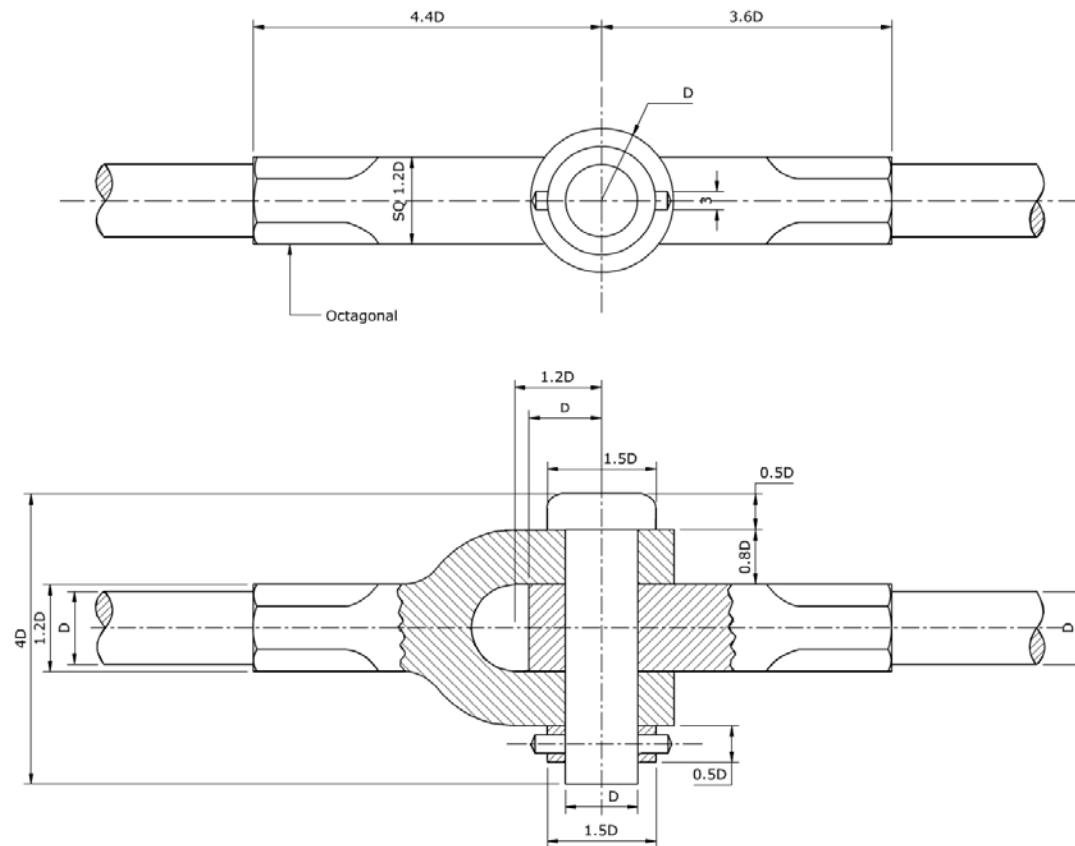
Procedure

1. Set limits of Auto CAD screen. Set units   Type : Decimal, Insertion scale : Millimetres
2. Insert line types Centre line and Dashed line into the drawing using Linetype command.
3. Draw the centre line. Draw the pin in the top view by taking D as diameter 4D as length. Draw the Eye end and Forked end using line, circle and arc commands.

Draw a octagon and draw the octagonal ends of the rods by drawing projections from the octagon drawn in the side view. Erase the octagon after drawing projections.

4. Draw the collar by taking 1.5D diameter and 0.5D as length. Draw the pin inside the collar.

5. Represent partial section by applying hatching using hatch command.

6. Drawing the projections from the top view draw the front view using line, arc or circle, fillet and trim commands.

7. Create a new layer using layer command and set color for layer to display dimensions. Name this layer as Dim

8. Create a new dimension style. Draw all dimensions of the drawing in Dim layer.

Precautions

1. Use zoom and Pan Commands properly while doing trim and fillet operations at very small dimensions.

2. Use line type scale command(lts) for correct display of dashed and center lines.

3. Use hatchedit command to adjust the hatching of the sections.

4. Draw all the dimensions in new layer only.

Result

Knuckle joint has been drawn successfully using Auto CAD software.

Introduction to AutoCAD

Answers to Multiple choice questions

Chapter 1

1. The toolbar at the top of the AutoCAD 2008 window is:
    (a) The **Draw** toolbar
    (b) The **Modify** toolbar
    (c) The **Standard** toolbar
    (d) The **Properties** toolbar

2. The **DesignCenter** palette can be opened from the:
    (a) **Layer** toolbar
    (b) **Properties** toolbar
    (c) **Modify** toolbar
    (d) **Standard** toolbar

3. Press the **F9** key of the keyboard for:
    (a) **Grid** on/off
    (b) **Snap** on/off
    (c) **Ortho** on/off
    (d) **Osnap** on/off

4. In the coordinate system of AutoCAD 2008:
    (a) Positive **x** figures are to the left
    (b) Positive **x** figures are to the right
    (c) Positive **x** figures are in the direction vertically upwards
    (d) Positive **x** figures are in the direction vertically downwards.

5. Drawing templates are held in files with the file extension:
    (a) *.dwt
    (b) -*.dwg
    (c) *.bmp
    (d) *.dwr.

6. A *left-click* on a name in a drop-down menu showing three dots (**...**) appearing after the name means that:
    (a) A command name will appear at the command line
    (b) A dialog will appear on screen
    (c) A sub-menu will appear
    (d) A tool will be activated.

7. AutoCAD 2008 can be opened with:
    (a) A *left-click* on the AutoCAD 2008 shortcut icon in the Windows desktop
    (b) By typing **acad** at the keyboard
    (c) Automatically when the computer is switched on
    (d) By selecting from a list which appears on screen when the computer is switched on.

8. The term *dragging* means:
    (a) *Left-click* on an item and the item can be moved to another position on screen
    (b) *Double-click* on an item. The item can then be moved to another point on screen;
    (c) Holding down the left-hand button of the mouse on an item can be moved to another point on screen
    (d) Press the right-hand button of the mouse. This allows an item to be moved anywhere on screen.

9. An arrow appearing after a name in a drop-down menu means that:
    (a) A command name will appear at the command line
    (b) A dialog will appear on screen
    (c) A sub-menu will appear
    (d) A tool will be activated.

10. A tool tip is:

    (a) The tool name appearing in a rectangle when the cursor is placed on a tool icon

    (b) The name given to a tool

    (c) The instruction which appears at the left-hand end of the status bar when a tool is chosen

    (d) A tip which can be read from the **Help** screen for a tool.

Chapter 2

1. To call the **Line** tool from the command line, the following abbreviation can be *entered*:

    (a) lin

    b) li

    (c) l

    (d) ln.

2. When the **F6** key of the keyboard is pressed, the following facility is toggled on/off:

    (a) Snap

    (b) Ortho

    (c) DUCS

    (d) DYN.

3. The key **F9** toggles on/off:

    (a) Snap

    (b) Ortho

    (c) Grid

    (d) DYN.

4. When *entering* **absolute** coordinate numbers at the command line, the coordinates are preceded by:

    (a) The letter **a**

    (b) The symbol @

    (c) The letters **ab**

    (d) There is no need to *enter* anything in front of the coordinate numbers

5. The command line abbreviation for the **Circle** tool is:

    (a) cir

    (b) c

    (c) ci

    (d) cl.

6. What are the differences between outlines drawn using the **Line** tool and those drawn using the **Polyline** tool? Outlines from the **Line** tool form separate objects. Those from the **Polyline** tool form single objects.

Chapter 3

1. The **Arc** tool can be called by *entering* the following abbreviation at the command line:

    (a) ar

    (b) a

    (c) ac;

    (d) There is no abbreviation. The name arc must be *entered* in full.

2. The set variable **PELLIPSE** can be set to either **0** or **1** when it allows the following actions:

    (a) When set to **0** the **Edit Polyline** tool to be used on ellipses

    (b) When set to **1** the **Edit Polyline** tool to be used on ellipses

    (c) When set to **0** it allows ellipses to be drawn with the major axis at any angle

    (d) When set to **0** ellipses become polylines.

3. When saving an AutoCAD 2008 drawing it is filed with the extension:

    (a) *.drw

    (b) *.dwg

    (c) *.dwt

    (d) *dg.

4. The **Dynamic Input** (**DYN**) system can be toggled on/off by pressing which key of the keyboard:

    (a) F6

    (b) F7

    (c).F12

    (d) F3.

5. What is the function of *entering* **commandline** at the keyboard:

    (a). It enables the command line to be used for *entering* command

    (b). It brings back the command palette when it has been hidden

    (c). It can only be used when **DYN** is set on to allow Dynamic Input to work

    (d). It places the command palette at the bottom of the screen.

6. The **Polyline Edit** tool can only be used when working with polylines:

    (a) True

    (b) False.

Chapter 5

1. What is the purpose of the set variable **MIRRTEXT**:

    (a} To ensure that text is mirrored correctly

    (b) To enable text to be mirrored with a drawing, when the **Mirror** tool is in use

    (c) To make sure that text is deleted from drawings when acted upon by the **Mirror** tool

    (d) To show text clearly in drawings acted upon by the **Mirror** tool.

2. When using the **Rotate** tool the angle of rotation is in the following direction:

    (a) Clockwise

    (b) Anticlockwise

    (c) The direction in which the cursor is moved

    (d) There is no fixed rotation direction.

3. When using the **Stretch** tool:

    (a) Circles can be stretched into ellipses

    (b) The tool has no effect upon circles

    (c) Be careful because circles can be erased

    (d) Treat circles like any other part of the drawing being stretched.

4. When using the **Break** tool on circles and/or arcs:

    (a) Breaks can be made in any direction

    (b) Breaks can only be made in a clockwise direction

    (c) Breaks can only be made in an anticlockwise direction

    (d) Break cannot be made in circles or arcs.

5. The **Join** tool can be used for joining:

    (a) Any two arcs

    (b) Only arcs or lines in line with each other

    (c) Any two lines or plines

    (d) Any objects can be joined to each other.

Chapter 6

1. When dimensioning from the command line what do the following abbreviations mean?

    (a) hor? horizontal

    (b) ver? vertical

    (c) int? intersect

    (d) per? perpendicular

2. An aligned dimension is one which:

    (a) Is aligned to the previous dimension;

    (b) Is in line with the object being dimensioned

    (c) Can only be used when placing a dimension with a radius

    (d) Is lined up with the edges of the drawing area of AutoCAD.

3. There are two types of fonts which can be used when adding text to drawings in AutoCAD 2008. Name them. **AutoCAD SHX** and **Windows True Type**

4. The "style name" of a text refers to:

    (a) The font in use

    (b) The height of the text

    (c) Whether the text is in **bold**, *italic* or regular;

    (d) Whether the text is **AutoCAD SHX** or **Windows True Type**.

5. The difference between **Singleline** text and **Multiline** text is:

    (a) Only one line of text can be added to a drawing with **Single Line text**, whereas many lines of text can be added using **Multiline** text

    (b) Singleline text is text *entered* directly at the command line. **Multiline** text must be *entered* in a window

    (c) There is no difference

    (d) Singleline text can be added in one style only. **Multiline** text can be added in any style.

Chapter 7

1. In first angle orthographic projection an end view is:

    (a) Always placed to the right of the front view

    (b) Viewed from the one side and placed on the other side of the front view

    (c) Always placed to the left of the front view

    (d) Placed either side of the front view irrespective of the viewing position

2. In third angle orthographic projection a plan is:

    (a) Placed either above or below the front view depending upon whether the viewing is from above or below

    (b) Always placed above the front view

    (c) Always placed below the front view

    (d) Placed either above or below no matter which viewing direction is chosen.

3. Isometric drawing is:

    (a) A true 3D (three-dimensional) pictorial view of the object being drawn

    (b) A 2D (two-dimensional) pictorial view of the object

    (c) An accurate perspective drawing of the object

    (d) None of the items **a**, **b** or **c**.

4. If a layer is locked:

    (a) Details can be added to a locked layer

    (b) Details can be erased from a locked layer

    (c) Details cannot be added or erased from a locked layer

    (d) Details can be added to a locked layer but they disappear when the drawing file is saved.

5. When a layer is turned off:

    (a) File space is saved when saving the file

    (b) It makes no real difference. Details can still be added to the layer

    (c) Details cannot be erased from the layer

    (d) Details on the layer cannot be seen.

Chapter 8

1. Associative hatching is a term given to:

    (a) Types of hatching which can be joined together

    (b) Hatching which is associated with the colour of the area being hatched

    (c) Hatching which is associated with objects which are moved within a hatched area

    (d) Hatching which is associated with a hatched area from another part of a drawing.

2. The **Hatch and Gradient** dialog can be called to screen:

    (a) By *clicking* the **Hatch** tool icon in the **Draw** toolbar

    (b) By *entering* the abbreviation **h** at the command line

    (c) By *entering* **hatch** at the command line

    (d) By any one of the choices as given in **a., b.** or **c**.

3. When hatching a sectional view in an engineering drawing
    (a) Every detail cut by a section plane must be hatched
    (b) It is up to the operator constructing the drawing which parts are hatched
    (c) There is no need to hatch any part of the drawing
    (d) A bolt within a sectional view is not hatched.

4. When **Advanced** hatching is set to **Normal** all parts of a drawing will be hatched:
    (a) True?
    (b) False?

5. When text is *entered* in a hatched area:
    (a) The text will be surrounded by a non-hatched area only if **Advanced Normal** is set on
    (b) The text will be surrounded by a non-hatched area only if **Advanced Outer** is set on
    (c) The text will be surrounded by a non-hatched area only if **Advanced Ignore** is set on;
    (d) The text will be surrounded by a non-hatched area if any of the **Advanced** settings are set on.

Chapter 9

1. Which of the following is correct?
    (a) When a block has been constructed and saved the data is saved as file with a name in a named directory
    (b) When a block has been constructed and saved, the file data is saved as part of the file in which the block was constructed
    (c) When a block has been constructed and saved, the file data is saved as a separate file from the drawing in which the block was constructed
    (d) When a block has been constructed and saved, the file data is saved as new file.

2. Which of the following is correct?
    (a) When a wblock has been constructed and saved the data is saved as file with a name in a named directory
    (b) When a wblock has been constructed and saved, the file data is saved as part of the file in which the block was constructed
    (c) When a wblock has been constructed and saved, the file data is saved as a separate file from the drawing in which the block was constructed
    (d) When a wblock has been constructed and saved, the file data is saved as new file.

3. The **DesignCenter** is:
    (a) A drop-down menu
    (b) A dialog
    (c) A palette
    (d) A *right-click* menu.

4. Which of the following statement is correct?
    (a) The **Purge** tool can only be used when inserting blocks
    (b) The **Purge** tool can be use to delete unwanted detail from any drawing
    (c) The **Purge** tool can only be used only for deleting exploded blocks from drawings
    (d) The **Purge** tool can only be called by *entering* **purge** at the command line;

Chapter 10

1. When copying a drawing constructed in AutoCAD 2008 using the **Copy** command from the **Edit** drop-down menu, the drawing can be pasted into documents being worked in other applications. The method of copying and pasting makes use of:
    (a) A DXF file
    (b) An EPS file
    (c) Any item in any application can be automatically copied into another application
    (d) The drawing is transferred via the **Clipboard**.

2. When a drawing is saved as an EPS file and the EPS file is inserted into a document being worked in another application:

(a) Changes made in the AutoCAD drawing will automatically be updated to change in the drawing in the other application

(b) Changes made in the AutoCAD drawing are not reflected in the document into which the drawing has been inserted

(c) Changes made in the AutoCAD drawing are only changed in the inserted drawing after both the drawing and the document have been saved to file

(d) It does not matter whether the drawing is changed or not, no changes will be reflected in the other document.

3. The reason for saving an AutoCAD drawing as a DXF file is:

(a) The DXF file can be opened in any other Computer Aided Design (CAD) application

(b) DXF files take up less space on a file than the AutoCAD DWG file

(c) DXF files can be opened in a Microsoft Word document

(d) DXF files can be opened in earlier releases of AutoCAD.

4. External references (xrefs) can be described as:

(a. They are the same as blocks and are saved within the drawing file in which they were constructed, but can be inserted in other drawings

(b) They are different to blocks in that changes in an original external reference are reflected in the drawing in which the xref is inserted

(c) They are blocks which are saved to file names in their own right

(d) They are files which refer to parts within a drawing.

5. Which files with the following file name extensions are "raster" files?

(a) *.bmp

(b) *.dwg

(c) *.tif

(d) *.dxf

(e) *.jpg

(f) *.eps

(g) *.pcx

Chapter 11

1. An AutoCAD sheet set is:

(a) A number of drawings which have been printed from AutoCAD drawings and saved in an envelope

(b) A series of printed AutoCAD drawings

(c) A number of AutoCAD drawings saved in Paper Space format and held in a file

(d) Any drawings relating to a specific architectural, building or engineering process.

2. Drawing for a sheet set must be:

(a) Saved in Model Space format

(b) Saved in Paper Space format

(c) Saved in either Model Space or Paper Space format

(d) Saved in *.dwf format.

3. DWF is an abbreviation for a file extension. The abbreviation stands for:

(a) Drawing with files

(b) Design with file

(c) Design Web File

(d) Design Web Format.

4. DWF files can be included as attachments in an email. Is this statement:

(a) True

(b) Only partly true

(c) Incorrect

(d) Only when sent as a Zip file.

Chapter 13

1. The **Region** tool can be called by *entering* the following abbreviation at the command line when using **Dynamic Input**:

   (a) re
   (b) reg
   (c) regi
   (d) There is no abbreviation for this command.

2. When using the **Extrude** tool the set variable **ISOLINES** must be set to:

   (a) 4
   (b) 16
   (c) Any number
   (d) Any number below 2047.

3. When using the **Extrude** tool which of the following can be extruded?

   (a) Regions
   (b) An outline constructed using the **Line** tool
   (c) Circles
   (d) Closed plines
   (e) Ellipses
   (f) Any outline
   (g) Another extrusion.

4. When using the **Revolve** tool which of the following can be extruded?

   (a) Regions
   (b) An outline constructed using the **Line** tool
   (c) Circles
   (d) Closed plines
   (e) Ellipses
   (f) Any outline
   (g) Another solid of revolution.

5. Can the **Union** tool be used to form 3D solid drawings from a number of objects constructed using any of the **3D Objects** tools **Box**, **Sphere**, **Cylinder**, **Cone**, **Torus** and **Wedge**?

   (a) Yes
   (b) No
   (c) Only from the **Box** and **Cone** tools
   (d) Yes, but not from the **Torus** tool.

6. Which of the following tools from the **2D Draw** control panel can be used when constructing 3D solid model drawings - **Move**, **Copy**, **Chamfer**, **Fillet**, **Mirror**, **Rotate**, **Scale**?

   (a) None of them
   (b) Only the **Chamfer** and **Fillet** tools
   (c) Any of them
   (d) Only **Move** and **Copy**.

7. Why is the name **Boolean** operators given to the tools **Union**, **Subtract** and **Intersect**?

   (a) It is the name made up for this purpose by computer programmers
   (b) It is just a name selected for this purpose
   (c) It is based on the name of the scientist George Boole
   (d) Boolean is a name always given to this type of construction.

8. Is it possible to form unions between solids constructed using the **Extrude** tool and solids formed using the **3D Objects** tools?

   (a) Yes
   (b) No
   (c) Only when the **3D Objects** tool is the **Box** or **Sphere** tool
   (d) Only when the **3D Objects** tool is the **Cone** tool.

Chapter 14

1. When constructing 3D model drawings in multiple viewports:

    (a) The set variable **UCSFOLLOW** must be set to on

    (b) The set variable **UCSFOLLOW** must be set to off

    (c) It does not matter whether the set variable **UCSFOLLOW** is set on or off

    (d) The set variable **UCSFOLLOW** must be set to **3**.

2. When constructing 3D model drawings in multiple viewports:

    (a) The UCS icons must not be showing in each viewport

    (b) It does not matter whether the UCS icons are showing in viewports or not

    (c) The UCS icon must be showing in the isometric view viewport

    (d) The UCS icon must be showing in the Front and Plan viewports.

3. When constructing 3D model drawings in multiple viewports:

    {a} Each viewport must be set independently to different viewpoints from the **Visual Styles** menu

    {b} Only when working in a particular viewport will its viewpoint need to be set

    {c} Each viewport is set to different viewpoints when a multiple viewport is chosen from the **Viewports** dialog

    {d} Each viewport is set to different viewpoints when a multiple viewport is chosen from the **Viewports** dialog only if the **Setup** popup list is set to **3D**.

Chapter 15

1. Is it possible to construct a polar array from a 3D solid model drawing using the **Array** tool from the **Modify** toolbar?

    (a) No

    (b) Yes

    (c) If your answer is Option **a** or **No**, with which tool can one construct an array from a 3D solid model drawing

    (d) Only if the 3D solid model drawing is placed in the World UCS.

2. From which of the following toolbars can the **Mass Properties** tool be called?

    (a) Modify

    (b) Draw

    (c) Standard

    (d). Inquiry

3. The purpose of the **Viewpoint Presets** dialog is:

    (a) To set a 3D solid model drawing in any form of viewing position

    (b) To set a 3D solid model drawing in an isometric view

    (c) To set a 3D solid model drawing in a perspective view

    (d) To set a 3D solid model drawing is an orthographic view.

4. The **Slice** tool is used for slicing a 3D solid model into:

    (a) Two parts

    (b) Two parts ready for the calling of the **Section** tool

    (c) Into as many parts as are required

    (d) To remove a part not wanted in a 3D solid model drawing.

5. When using the **Section** tool on a 3D solid model drawing:

    (a) Hatching of the resulting sectional view is automatic

    (b) The section outline must be removed from the 3D solid model drawing

    (c) Only a sectional view outline is formed

    (d) The resulting sectional view automatically appears as a separate view in the drawing area.

6. Before viewing positions can be set from the **Viewpoint Preset** dialog the set variable **UCSFOLLOW** must first be set:

    (a) On

    (b) Off

    (c) To the figure of **2**

    (d) It does not matter whether it is set on or off.

7. Is it possible to mirror a 3D solid model drawing using the **Mirror** tool from the **Modify** toolbar?

    (a) No

    (b) Yes

    (c) If your answer is Option **a** or **No**, with which tool can one mirror a 3D solid model drawing?

    (d) Only if the 3D solid model drawing is placed in the World UCS.

Chapter 16

1. Can **Ambient** lighting be set at a figure before rendering a 3D model?

    (a) Yes

    (b) No

    (c) Requires a setting in a dialog

    (d) Set to a figure of 0.3.

2. When setting lighting before rendering a 3D model **Distant** light can be described as:

    (a) A light the value of which diminishes in intensity the further the light position is set from the 3D model

    (b) Its light value is of the same intensity no matter how far the light position is set from the 3D model

    (c) Its intensity increases when set in front and above the 3D model compared with its being set to the side and above the model

    (d) A light which sheds rays in all directions from its set position.

3. Which in your opinion gives the best rendering results;

    (a) Medium

    (b) High

    (c) Presentation

    (d) They are all as good as each other?

4. Can a 3D model which has been **Conceptual** shaded when using the **3D Orbit** tool be rendered after attaching materials:

    (a) Yes

    (b) No

    (c) After materials have been added to a 3D model it cannot be **Conceptual** shaded

    (d) The 3D Orbit tool cannot be used after rendering has taken place.

5. When printing or plotting a 3D model, which of the following statements is correct:

    (a) A rendered 3D model in a single viewport can be plotted in full colour

    (b) A Conceptual shaded 3D model in a single viewport can be plotted in full colour

    (c) A four-view viewport screen of a rendered 3D model in Model Space can be plotted in full colour

    (d) A four-view viewport screen of a Conceptual shaded 3D model in Model Space can be plotted in full colour.

Chapter 17

1. The term **UCS** stands for:

    (a) User Coordinate State

    (b) Using Cordinates Screen

    (c) User Coordinate System

    (d) User Coordinate Set.

2. Before the **UCS** system can be used:

    (a) The set variable **UCSFOLLOW** must be set to **1**

    (b) The set variable **UCSFOLLOW** must be set to **0**

    (c) It does not matter whether the set variable **UCSFOLLOW** is set to any number, the UCS system will still operate

    (d) The set variable **UCSFOLLOW** does not need to be set because it becomes operative when the UCS is in use..

3. Before the **UCS** system can be used, the **UCS icon**:
    (a) Must be showing somewhere on screen
    (b) Need not appear anywhere on screen
    (c) Must be showing at the bottom left-hand corner of the screen
    (d) The UCS icon can only show on screen if the setting of the set variable **UCSFOLLOW** is correct.
4. The term **UCS WORLD** applies to:
    (a) The plane on which the operator is working at the time
    (b) The standard **XY** plane which appears when AutoCAD is loaded on screen
    (c) Any one of the orthogonal planes
    (d) Any plane set when working in the UCS.
5. A 2D outline constructed using the line and circle tools can be extruded to form a 3D model:
    (a) Yes
    (b) No
    (c) Only if is first made into a region
    (d) Either if it first made into a region or if its outline is edited to form a closed polyline.

Chapter 18

1. When calling the **Extrude** tool the following abbreviation can be *entered* at the command line::
    (a) ex
    (b).extr
    (c) There is no abbreviation. The name **extrude** must be *entered* in full
    (d) ext.
2. When a selected face of a 3D solid model drawing is selected by the **Move Faces** tool from the **Solids Editing** toolbar, the face is:
    (a) Moved away from the 3D solid as a separate entity
    (b) Moved in such a manner that the body of the 3D solid to which the face is attached is extruded
    (c) Moved to be placed on another 3D model
    (d) The whole of the 3D model is moved.
3. Is it possible to use the **Extrude faces** tool from the **Solids Editing** toolbar on a region constructed from a closed polyline?
    (a) Yes, any region can have its face extruded using this tool
    (b) Yes, if the region has not been obtained by using any of the Boolean operators
    (c) No - a region of any type cannot be acted upon by this tool
    (d) Yes, providing the line of extrusion is a straight line or polyline.
4. The **Boolean** operators - **Union**, **Subtract** and **Intersect** tools are found in the toolbar:
    (a) Modeling
    (b) UCS
    (c) Solids Editing
    (d) UCS II.

Chapter 19

1. The **Solprof** tool is used for the following purpose:
    (a) To produce a profile for a 3D solid model drawing in a database
    (b) To produce an outline-only drawing from a 3D solid model drawing
    (c) To provide a profile similar to a front view from a 3D solid model drawing
    (d) To change a 3D solid model drawing from a Model Space drawing to a Paper Space drawing.
2. A polygonal viewport can be constructed in a Model Space viewport:
    (a) This is not true. A polygonal viewport can only be constructed in Paper Space viewports
    (b) Yes. A polygonal viewport can be constructed in either Model Space or Paper Space
    (c) Yes. A polygonal viewport can be constructed in Model Space by *clicking* the **MODEL** button when in paper Space
    (d) Yes providing there is only a single viewport on screen.

3. A drawing can only be printed or plotted from a Paper Space drawing:

    (a) This correct

    (b) Yes - providing the **MODEL** button has been *clicked*

    (c) Drawings can be printed or plotted from either Model Space or Paper Space

    (d) Drawings can be printed from Paper Space, but plotted only from Model Space'

4. A file name with the following extension shows that the file is a raster file:

    (a) *.dwg

    (b) *.dwt

    (c) *.bmp

    (d) *.dxf.

5. When a photograph has been inserted in an AutoCAD drawing on screen, when the drawing is printed or plotted, the photograph does not print or plot with the drawing:

    (a) This is correct

    (b) This is not true. The photograph will print or plot along with the drawing

    (c) This is true only if the photograph was inserted in a drawing in paper Space

    (d) This is true only if the photograph was inserted in a drawing in Model Space.

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1 :: To reverse the UNDO command the correct entry is?

(a) REDO
(b) REDRAW
(c) Esc
(d) U

2 :: Which of the following statements is true for AutoCad?

(a) ZOOM ALL will reach beyond the drawing limits if an object is there.
(b) ZOOM ALL only reaches out to the drawing limits.
(c) There is not real difference between ZOOM ALL and ZOOM E.
(d) ZOOM ALL makes all objects visible irrespective of the layer visibility state.

3 :: The command to scale a paper space viewport to half the drawn size is?

(a) Zoom 0.5x
(b) Zoom 1/2x
(c) Zoom 2xp
(d) zoom 0.5xp

4 :: Which one of the following options of the UNDO command allows the undo facility to be disabled?

(a) AUTO
(b) CONTROL
(c) END
(d) GROUP

5 :: Which one of the following commands forces AutoCAD to revise the entire drawing taking into account the effect of changes within the system?

(a) CHANGE
(b) REDO
(c) REDRAW
(d) REGEN

6 :: Which one of the following commands allows simultaneous pan and zoom?

(a) ZOOM DYNAMIC
(b) ZOOM EXTENTS
(c) ZOOM CENTER
(d) ZOOM PAN

7 :: Which one of the following commands CANNOT be undone?

(a) XREF
(b) SETVAR
(c) SAVE
(d) LIST

8 :: The MAXIMUM number of commands whose effect can be undone by the UNDO command is?

(a) 256
(b) 1000
(c) all the command issued since the drawing was first created
(d) all commands issued since the drawing was last loaded into
the drawing editor

9 :: Which one of the following commands would be used to limit the movement of the cursor to specified increments?

(a) AXIS
(b) GRID
(c) ORTHO
(d) SNAP

10 :: Which one of the following commands can be used to turn the grid through 45 degrees ?

(a) AXIS
(b) GRID
(c) ROTATE
(d) UCS

11 :: When producing a drawing of a site plan measuring 300m x 275m dimensions should be entered to a scale of?

(a) 1:1
(b) 1:10

(c) 1:100
(d) 1:1000

12 :: Which one of the following BEST defines a "prototype" or "template" drawing?

(a) the drawing which is currently being edited by AutoCAD
(b) a drawing used to store a library of standard symbols
(c) a means of setting the initial drawing environment for new drawings
(d) a file which holds details of the display, digitiser, and plotters that AutoCAD is currently configured for

13 :: In order for the grid command to work correctly two settings have to be established.

(a) The correct limits set and an appropriate setting of the grid value set
(b) Limits set to ON and an appropriate setting of the grid value set
(c) Snap and Osnap set
(d) Gridmode and osmode both set to 1

14 :: When using AutoCAD for the design of a mechanical component measuring 1000 mm by 500 mm, the
dimensions would normally be entered at a scale of?

(a) 1:1
(b) 1:2
(c) 1:5
(d) 1:10

15 :: How many entity colours does AutoCAD support?

(a) 255
(b) 16
(c) unlimited
(d) 64

16 :: A house measures 15000 mm x 8000 mm in plan view. When drawing the plan view only which one of
the following sets of limits would be BEST to use?

(a) 0,0/20000,15000
(b) 0,0/20,15 metres
(c) -2000,-2000/20000,15000
(d) -2000,-2000/15000,8000

17 :: What option would be selected following the TEXT command to select a different type of text to that
currently in use?

(b) FONT
(c) SET
(d) STYLE

18 :: The special character string that causes text to be underlined is

(a) u%%
(b) %%u
(c) %u%
(d) %u

19 :: Which of the following is an AutoCAD font for mathematical symbols?

(a) MATHC
(b) MATHFONT
(c) MATHSYM
(d) SYMATH

20 :: The effect of QTEXT being ON is to?

(a) place text directly in the drawing as defined
(b) speed up drawing regeneration by replacing text with rectangles
(c) use simplified text font to replace complex text font
(d) allow automatic line spacing of textual input

21 :: The text option that prompts the user for two endpoints and then automatically calculates the text height
and positions the text between the two points is chosen from this AutoCAD prompt
Align/Fit/Center/Middle/Right/TL/TC/TR/ML/MC/MR/BL/BC/BR
Which one is correct?

(a) Center
(b) Align
(c) TR
(d) Fit

22 :: Which of the following commands will NOT place some form of text within the drawing

(a) MTEXT
(b) DTEXT
(c) STYLE
(d) ATTDEF

23 :: When is a space NOT interpreted as the enter key?

(a) When entering text.
(b) When using the PEDIT command.
(c) When selecting objects.
(d) The space is always an alternative to the enter key.

24 :: The special character string that is used to print the diameter sign is

(a) %%c
(b) %%d
(c) %dia
(d) c%%

25 :: Which one of the following is the AutoCAD filename extension used to indicate a compiled text font?

(a) HDX
(b) SHP
(c) SHX
(d) TXT

26 :: Which one of the following could be an AutoCad drawing file?

(a) DWG.PLAN
(b) PLAN.DWG
(c) DRAW.FLE
(d) FILE.TXT

27 :: The line types definitions are stored on the system with an extension of?

(a) .LTT
(b) .LSP
(c) .LIN
(d) .LAT

28 :: Which one of the following key combinations is a standard windoze short cut that does not relate to the clipboard.

(a) Ctrl + S
(b) Crtl + X
(c) Ctrl + V
(d) Ctrl + C

29 :: The shortcuts or command alias that allows us to key in L and AutoCAD responds with LINE are stored in a file named

(a) SHORT-CUT.TXT
(b) ACAD.COM
(c) ACAD.PGP
(d) ACAD.EXE

30 :: Which of the following key combinations issues the ISOPLANE command?

(a) CONTROL and T or F4
(b) CONTROL and E or F5
(c) CONTROL and D or F6
(d) CONTROL and I or F7

31 :: Which of the following statements is true?

(a) Backup copies of drawing files are saved in the "Support" folder.
(b) Backup copies of drawing files are saved in a folder set by the user.
(c) When a drawing is initially saved a backup copy is made with a .BAK
extension. This can be renamed as a .DWG at a later date.
(d) When a drawing is saved for the second time a backup copy is made with
a .BAK extension. This can be renamed as a .DWG at a later date.

32 :: Which one of the following key combinations will toggle SNAP?

(a) Either F7 or CONTROL and G
(b) Either F6 or CONTROL and D
(c) Either F9 or CONTROL and B
(d) Either F8 or CONTROL and O

33 :: Which one of the following key combinations will toggle COORDS?

(a) Either F7 or CONTROL and G
(b) Either F6 or CONTROL and D
(c) Either F9 or CONTROL and B
(d) Either F8 or CONTROL and O

34 :: When designing an integrated circuit measuring 5mm x 5mm the measurements should be entered using a scale of

(a) 1:1
(b) 1:2
(c) 1:10
(d) 1:5

35 :: Which one of the following best describes a "user co-ordinate System"?

(a) The pair of co-ordinate points which define the lower left and upper right corners of the drawing boundary
(b) A series of co-ordinate points stored as variables for later use in the drawing
(c) A co-ordinate system whose origin is located anywhere in three dimensional space
(d) The master datum from which all measurements are taken.

36 :: Absolute co ordinates are measured from the

(a) current UCS origin.
(b) last point entered.
(c) lower left hand corner as set by LIMITS command.

37 :: The position of a mouse on a surface is NOT directly related to the position of the screen cursor. This makes the mouse unsuitable for

(a) Selecting two points on the screen for a line draw operation.
(b) Tracing an existing drawing.
(c) Selecting menu items on the screen.
(d) Sketching.

38 :: Which one of the following is an AutoCAD absolute point co-ordinate?

(a) @361,270
(b) 60<90
(c) 361,270
(d) None of the above

39 :: When drawing a digital watch measuring 30mm x 25mm, which one of the following would be the BEST set of drawing limits to use?

(a) 0,0/40,35
(b) 0,0/30,25
(c) 0,0/100,100
(d) 0,0/297,210

40 :: To continue drawing a line from the last known point, enter

(a) 0,0
(b) @
(c) Next
(d) a or b

41 :: Which one of the following is an AutoCAD relative polar co-ordinate

(b) @81,30
(c) 30<81
(d) @81<30

42 :: ou are designing a floor plan and know the length and angle of one of the wall segments to be 1500mm
and 30 degrees. This is to be followed by a wall 2000mm long at 90 degrees to the first.
Which one of the following is the correct input?

Which one of the following is the correct input?

(a) @1500,30 @2000<120
(b) 1500<30 @2000<90
(c) @1500<30 @2000<90
(d) @1500<30 @2000<120

43 :: Which one of the following would draw a vertical line 30 units in length from a previously defined point
given as 30,50?

(a) 60,50
(b) 30,80
(c) @30,0
(d) @30<0

44 :: The shape above is based on a 10 unit module. which is the correct set of codes to draw this shape,
starting at the lower left and moving anti clock wise

(a) 0,0 10,0 @10<45 10,10 0,20 0,30 c
(b) 0,0 10,0 @10,10 10,10 @0,20 0,30 c
(c) 0,0 @10<0 20,10 10,10 10,30 30,0 c
(d) 0,0 @10,0 @10,10 10,10 0,20 0,30 c

45 :: There are at least eleven options to the "select objects" prompt. Which of the following has an incorrect
option?

(a) W WP R
(b) C CP F
(c) L ALL E
(d) P SI A

46 :: When using the move command to move a single object by a given distance, which is the best of the
following methods?

(a) Set osnap to END, pick the object, pick a base point then pick on the
end of another object
(b) Pick the object then key in the relative distance that it is to be
moved
(c) Pick the object then key in the absolute distance that it is to be
moved
(d) Pick the object, key in 'END' key in 'END' again then pick on the end
of another object

47 :: The "select object" option "Previous" is best described by

(a) Picks the single object drawn by the previous command
(b) Picks the previous drawn single object
(c) Picks the previously picked group of objects
(d) Picks the previous object in a Window or Crossing selection

48 :: The following two commands used one after the other BOUNDARY then
pick inside an area ERASE ALL
R LAST produces which of these results

(a) Changes layer to the Boundary layer then erases all items on the last layer
(b) Calculates the area of the boundary and erases all the construction lines
(c) Draws a polyline that touches the extremes of the area then erases all the recently drawn lines
(d) Draws a polyline that touches the extremes of the area then erases all but that polylin

49 :: Which one of the following system variables disables the prompt which asks for attribute values, and causes attributes to be set to their defaults?

(a) ATTDIA
(b) ATTDISP
(c) ATTPROMPT
(d) ATTREQ

50 :: Which one of the following best defines attributes as used in AutoCAD and defined by the command DDATTDEF.

(a) Text entities that can link to a database.
(b) Special text entities within a block.
(c) Text entities that use an alternative font.
(d) Special text entities.

51 :: What is the significance of using the command WBLOCK?

(a) WBLOCK only works on blocks.
(b) the block is written to disk and can be used later in other drawings.
(c) the block is written to the current drawing file only, saving disk space.
(d) the block can have attributes written to it later.

52 :: The effect of the EXPLODE command when applied to a block is to?

(a) reduce a block to it's constituent entities to allow editing.
(b) return a block to it's created scale and rotation.
(c) allow the editing of a block with different X,Y factors.
(d) place constituent entities all onto the current layer.

53 :: The use of blocks allows libraries of standard parts to be developed and saved for latter use. Blocks may be stored

(a) on disk.
(b) on disk, CDROM and the Internet.
(c) on disk and CDROM.
(d) on disk and the Internet.

54 :: Which one of the following methods should be used to repeat a complex part in a drawing in order to minimise file size?

(a) use the COPY command
(b) use the MIRROR command
(c) use the ARRAY command
(d) create a BLOCK then use INSERT

55 :: Which one of the following is a correct statement regarding AutoCAD blocks?

(a) Blocks can only be inserted into a drawing if they already exist in that drawing.
(b) A block can have no more than ten attributes.
(c) The insert command looks first within the drawing for blocks and then to the disk.
(d) Every block has to have at least one attribute.

56 :: The SETVAR command is used to?

(a) configure the program settings to suit the various hardware devices
(b) configure AutoCAD for use with a tablet menu
(c) create an 'object set' for editing
(d) change the values of the system variables

57 :: If the system variable MIRRTEXT is set to 1, text is

(a) mirrored
(b) not mirrored
(c) not reproduced in the mirror image
(d) mirrored and reversed

58 :: Which one of the following allows the value of the system variable PICKBOX to be changed whilst in the ERASE command?

(a) SETVAR pickbox or PICKBOX
(b) 'SETVAR pickbox or 'PICKBOX
(c) 'SELECT
(d) CHANGE

59 :: Which one of the following system variables determines the visibility of the control points of a pline spline curve?

(a) SPLFRAME
(b) SPLMODE
(c) SPLINESEGS
(d) SPLINEVIEW

60 :: The system variable SPLINETYPE determines?

(a) whether the 'curve' option of the PEDIT command produces a spline curve or a fit curve
(b) whether editing functions are performed on the spline curve or on it's controlling frame
(c) the accuracy of approximation of a spline curve
(d) whether a spline curve is a quadratic b-spline or cubic b-spline

61 :: Which of the following system variables controls the accuracy of approximation of a spline curve?

(a) SPLFRAME
(b) SPLINEFIT
(c) SPLINESEGS
(d) SPLMODE

62 :: Which one of the following commands can be used to change the value of a system variable?

(a) CHANGE
(b) DIMVAR
(c) SELECT
(d) SETVAR

63 :: One effect of setting the value of MIRRTEXT=0 is that?

(a) text is displayed but not mirrored
(b) text is displayed as a mirror
(c) text is not displayed
(d) only text can be mirrored

64 :: Which one of the following is the BEST procedure for drawing a line from the point of intersection of a line and a circle?

(a) Select the LINE command and then use object snap with the INS option.
(b) Select the LINE command and then use object snap with the INT option.
(c) Set a small SNAP value then select the LINE command and SNAP.to the intersection
(d) Zoom in on the intersection, then select the LINE command and click the LH mouse button for the start point.

65 :: When breaking a circle the break will occur in the

(a) anti clockwise direction
(b) clockwise direction
(c) horizontal direction
(d) shortest direction

66 :: Which one of the following statements is False?

(a) Plines can be filled but not outlined.
(b) Plines can have either a consistent width or varying widths.
(c) Plines can be made from lines and arcs.
(d) Plines can be smoothed.

67 :: Which of the following shapes CANNOT be drawn by the polygon command?

(a) Square
(b) Hexagon
(c) Rectangle
(d) Equilateral triangle

68 :: The effect of freezing a layer is to?

(a) make it invisible and prevent regeneration
(b) make it invisible but allow regeneration
(c) allow visibility and regeneration
(d) display the layer but prevent editing of it

69 :: Which one of the following is the maximum number of layers which can be defined in an AutoCAD drawing?

(a) 64
(b) 128
(c) 256
(d) UNLIMITED

70 :: Which one of the following commands can be used to obtain information about a selected object?

(a) ID
(b) LIST
(c) MEASURE
(d) STATUS

71 :: AutoCAD has had the dreaded Model Space and Paper Space since R12. What is the main advantage of the system?

(a) It confuses students
(b) It converts 2D drawings to 3D
(c) It enables the CAD operator to set the scale of the
(d) It saves space because it requires fewer layers.

72 :: Why does AutoCAD allow you more than one layout?

(a) Different output devices.
(b) Different sizes of output.
(c) Different output orientation .
(d) All of the above.

73 :: A common command for many Windoze applications is "Page Setup". What in AutoCAD does Page Setup achieve?

(a) Sets the scale at which the drawing is printed.
(b) Sets the output device, also the size and orientation of the output
(c) Sets limits and the working units.
(d) Sets Up the paper size, margins and orientation

74 :: Which of the following key combinations does not invoke an I/O command?

(a) Ctrl + P
(b) Ctrl + F
(c) Ctrl + S
(d) Ctrl + O

75 :: In a Windoze dialogue box, moving from one field to another is achieved by which of the following key combinations?

(a) Ctrl + [Tab]
(b) Alt + [Tab]
(c) Shift + [Tab]
(d) [Tab]

76 :: When constructing an AutoCAD Solid Model the UCS command is used to

(a) Draw more accurately
(b) Draw Solid Objects
(c) Rotate Solid Objects
(d) Define a new Drawing Plane

77 :: When using the SOLVIEW command on a blank PS layout which sub command should be issued first
and why?

(a) UCS World because you have to start somewhere.
(b) UCS World because the world UCS is the only one available.
(c) Ortho because each view is to 90° to the other.
(d) Aux because one can line up the view more accurately.

1) What is Autocad?

Autocad is a software program built to design and shape the 2-D and 3-D images. It provides the tools by which a detail design of the product can be done. It also has the option to create detailed design layout, which can be automatically drawn by using source model.

2) What are the uses of Autocad?

Autocad can be used by the professionals to visualize the imaginary view of the product on a computer system. In Autocad, it is possible by the drafter to make the changes in the product before it gets finalized for design. It also gives the freedom for the designer to implement their various ideas and represent them to the suppliers or their clients.

3) What are the fields where you see maximum use of Autocad?

Autocad is more popular among the architects, engineers and builders for developing their building layouts.

4) What is the file formats used in design?

In Autocad, .dwg file format is used for design, it can be an interchangeable format. The file format which is interchangeable has the extension as DXF and operates data operability. It provides different languages which can be used as per the requirement.

5) How you can create a user interface in Autocad?

User interface can be created by using the command prompts to draw the plots and dialog boxes. The dialog boxes can be displayed by the use of PLOT command and the external database commands (ASE). Setting of CMDDIA to 1, allows the dialog boxes to run the command. The user interface creation also needs the command line to display the entire file so that it can be edited or customized easily.

6) What is the function of vertical integration?

To enhance the architectural designing of 3D object Autocad uses the vertical integration program. The 3D objects can include walls and other things that are associated with the data having information and simple objects like lines and circles. The data is programmed in such away that it represents only the architectural products and the extracted files, and can be modified according to the requirement.

7) What is the use of variant in Autocad?

In Autocad variants are used to help in creation, visualizing and rendering the 3D models that include 3D printing as well. Variants allows you to use the functionality of different application according to the requirement.

8) What are the benefits of using Autocad?

Autocad has replaced the traditional method of drafting and designing which was made by pencil, drafting boards, triangles and compass with just a set of a computer program. The benefits are immense like:

- Saves time and helps to increase the productivity
- It helps to streamline your design and documentation workflow
- Physical '3D' prototype of the design can be quickly created by using Autocad
- 3D models can be directly imported into Autocad by using application like SolidWorks
- Tedious work of drafting can be done easily and you can design and re-design the product in short span of time.

9) What is the process to draw a line more than one time and save it automatically?

When a need arises to draw a new line the process opens up a new file in a new session to write the file. Autocad allows saving multiple drawing for each session. The files are saved by using the file extension .dwg and it can be modified by using the browser.

10) What are the steps that enable the drag and drop feature in Autocad?

Autocad provides a way to drag and drop the elements by the use of "NOUN" and "VERB" in a dialog box. It allows the object to move from one place to another. Likewise, the remove or editing function can be done by using "MOVE and ERASE".

11) What are the features corrected by Autocad?

Autocad detects the problem and correct it by removing the corruption with the drawing parts. With the available option of adding additional vertices, it also adds vertices to the poly-lines. The error can be corrected or neglected by finding out the exact location of the poly-line that has zero vertices. The object can be deleted or removed after there is no use of it in the system.

12) How to set up a default drawing directory?

Default drawing directory has sub directories having the information using the windows commands. The applications, which are going to be used, are highlighted, and by using drag and drop features those application will be placed in the default directory. The properties for the application are selected from the menu and dialog boxes displayed on the front.

13) How you can copy a closed drawing?

The copying of the closed drawing can be done by the designer center in the toolbar of the Autocad. By using the tree view option the copy of closed drawing can be done easily. The modification of the drawing can be done by using graphical interface.

14) How you can hide the specific layers when plotting in Autocad?

To hide the specific layers while plotting, you can use various options like turning off the layers for plotting , freezing the layers and turning off. Turning off for plotting will show the layers on the screen but won't output on printing. The layers that are turned off will hide the layers and also it will not appear on the screen.

15) What is the process of copying the dimension styles from one drawing to another in Autocad?

Copying of dimension styles require setting up the particular dimension style. To copy a dimension style, a new document has to be created. Once it is created, this document will be saved as a drawing template. A new reference will be created by new drawing template document and it will show all the options like layer style, units and blocks. Drawing can be done by seeing the current drawing and dimension style would be same as the original picture. By using the design center, Autocad tools can be used to copy the dimension styles from one drawing to another.

16) How can you remove the empty layers from drawing?

The layers can be removed only when the object resides in the layers will be removed, once it is removed it is an empty layer. The empty layers cannot be deleted by purge. It might be because the layer is frozen on a viewport or referenced by an object in a block definition. By using EXPORT command it is possible to remove the layer from drawing, which results in creating a DXF file of the drawing. You can edit the dxf file in a text editor and rename all the instances of layers in the file, except the layer definition.

17) Why Autocad WS is more popular among mobile users?

Autocad WS provides many option for mobile application developer like edit, view and share. They can easily share the application wherever they go and can develop an application in a matter of time. The application can be downloaded and installed from anywhere in the world, ignoring the licensing problem. The users can save file in any format and can run the application

on any platform with ease.

18) How can you make a spring, spiral or screw thread?

To make a spiral or screw thread use an AutoLISP routine such as spiral.1sp, it will create a spiral path according to your need. Then you can use EXTRUDE command with a reference object, using the spiral as the path. Also, there is another way you can do this, by using Mechanical Desktop (MDT) or Autosurf by using augmented lines as path.

19) Tell me how you assign the keyboard characters or function keys to Autocad commands?

By editing the ACCELERATORS section of the Autocad menu file we can assign keyboard characters to Autocad commands.

20) How you can open a drawing file that was created with the automatic save features?

Autocad files have an extension of ".dwg" and will only open those files having this extension. To open the drawing files you have to rename it, by using Explorer or DOS prompt you can do that. If you are using EXPLORER you have to make sure that the option of "Hide file extensions for known file types" is not enabled. After the file is copied you can rename and use the OPEN command in Autocad to open the drawing.

21) What will you do when command prompts appear on the command line instead of ASE dialog box and plot dialog box?

In Autocad, CMDDIA variable controls the display of dialog boxes. To enable these dialog boxes you have to set CMDDIA to 1.

22) In Autocad, what is the command that is used to rotate the grid at 45 degress?

To rotate the grid at 45 degrees, command UCS is used.

23) In what situation command prompt appears instead of a dialog boxes?

If a file command is imported from a script or AutoLISP/ ObjectARX/ ADSRX a command prompt appears instead of a dialog box.

24) What are grips?

Grips are small boxes that appear on the objects you select. You can move or edit an object by dragging a grip.

25) What you are supposed to do when "Enter Attributes" dialogue doesn't display?

In this case, two variable controls this function, ATTREQ and ATTDIA , to see the "Enter