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Introduction to Computing – CS101

1.Introduction to Computer Science

Computer science is the study of computers and computing as well as their theoretical and practical applications. Computer Science is the discipline that seeks to build a scientific foundation for such topics as:

Hardware:

Computer hardware is the collection of physical parts of a computer system. This includes the computer case, monitor, keyboard, and mouse, hard disk drive, motherboard, video card, and many others.

Software:

Computer software, also called software, is a set of instructions and its documentations that tells a computer what to do or how to perform a task.

Programing:

programming is the process of designing and building an executable computer program.

Networks:

A computer network is a set of computers connected for the purpose of sharing resources. The most common resource shared today is connection to the Internet. Other shared resources can include a printer or a file server. The Internet itself can be considered a computer network.

Graphics:

Computer graphics is the discipline of generating images with the aid of computers. Digital photography, film, video games, cell phone and computer display, and many specialized applications.

Robots:

A robot is a machine—especially one programmable by a computer— capable of carrying out a complex series of actions automatically.

Database:

Any collection of data, or information, that is specially organized for rapid search and retrieval by a computer. A database management system (DBMS) extracts information from the database in response to queries.

Security:

Security are those controls that are put in place to provide confidentiality, integrity, and availability for all components of computer systems.

Algorithmic Solutions:

An algorithm is a set of instructions designed to perform a specific task.

Information Processing:

Information processing refers to the manipulation of digitized information by computers and other digital electronic equipment, known collectively as information technology (IT).

Computer Science Applications

Furthermore, Computer Science has applications in almost all domains such as:

- Telecom
- Banks
- Hospitals
- Software Development
- Service Industry
- Pak Army
- Freelancing
- And many more

Breadth First Learning

This course will give basic introduction to almost all courses of Computer Science. Such strategy of learning is known as Breadth First Learning. The other strategy is called Depth First Learning in which one particular course is first covered in details and then next course is covered.

Search Engine Usage Techniques

How can you effectively search over the internet using popular search engine.

Data Storage:

Data storage refers to the use of recording media to retain **data** using computers or other devices

Data Manipulation:

Data manipulation is the changing of **data** to make it easier to read or be more organized. For example, how basic arithmetic operations (+,- ,*, /) are performed in computer and how some advance operators are performed.

Operating System:

An **operating system** is a software which performs all the basic tasks like file management, memory management, process management, handling input and output, and controlling peripheral devices such as disk drives and printers.

Networking and the Internet:

We will also study how different computers communicate over the internet.

Algorithms:

We define algorithm as: "Set of Steps in a sequence to perform a certain task"

Artificial Intelligence:

You know Computer is a dump device, cannot think of take inferential decisions. However, Artificial Intelligence (AI) is a specialized field of Computer Science that aims at building such Computer Systems which can act intelligently.

Word Processing :

Word processor like Microsoft Word is an application software which helps to build editable word documents, we will cover all major functionalities of Microsoft Word.

Presentations Development:

Presentation are built in specialized tools like Microsoft Power point.

Spreadsheet:

To perform certain types of calculations on data, there are some specialized software like Spreadsheet. One of such software is Microsoft Excel which will be covered in such modules.

Search Engines :

Search Engine like Google index web pages and helps you to retrieve the relevant web pages based on your queries. There are many search engines like Google, Yahoo, and MSN etc.

Query:

Query is the set of words given to the search engine for searching for example, if you are interested to find "Virtual University" on the internet.

Capitalization:

Google does not distinguish the capital letters or small letters. This is called case-insensitive in computer science.

For example, search “COMPUTER SCIENCE” or “computer science”

Searching Tricks

Weather Searching:

You can simply add the location with the word “Weather” to form such query for example: Query “Weather Lahore” will give you a screen shown in the Figure 5.

Figure 5: Weather searching on Google

Performing Calculations on Google:

To perform calculations on Google, just type whatever you want to perform like if we want to multiply 12 with 391, we will type the query like:

12*391

Currency Conversion :

You can also see latest currency conversion on Google. For example, you want to see how much 100 Euros will be when converted to Pakistani rupees. Here is the query and result are shown in the Figure 7.

Figure 7: Currency conversion on Google

1.Search Operators

search operators that can be used on the Google to retrieve more relevant and focused results

Search on Social Media:

When you want to use Google and want to search the query on a particular social media, you can add "@" symbol. For example, when we give queries: "Fifa World cup @facebook" and "Fifa World Cup @Twitter",

Searching Hash tags:

On Social media, sometimes, a hash tag is very popular, if you are interested to identify such pages using hash tag, you can use the query like:

"#education"

Wild Card based Searching :

You can search a phrase when even you do not know what word would be there at a particular location for example, you want to search all those pages which contains any word in the start and then contains the exact phrase "is thicker than water".

You can write: **"* is thicker than water"**

2.Search Operators

- **Searching within the range**
- **Boolean Operators**
- **Search with a Specific Site**
- **Searching Related Websites**

- **Searching a cached version**

3.Search Operators

- **Stocks Operator**
- **Map Operator**
- **Movie Operator**
- **Compare Food**
- **Image Search**
- **Tilt**

Advanced Search Operators

- **Intitle**
- **Allintitle**
- **inurl and allinurl**
- **Intext and allintext**
- **Proximity Search**

What we should not search on Internet

There are many things which we should not search on Google. But Why?

There are three main reasons:

1) Google Adds: Google give you advertisements based on your search queries, history, geographical location etc.

2) Security Agencies: law and enforcement agencies might see your queries and can enquire you or can reach at your location if they see a sensitive term searching again and again.

3) Sometimes, when we search like free music, we can be trapped to provide a virus which might be harmful for our computer.

Avoiding Ads:

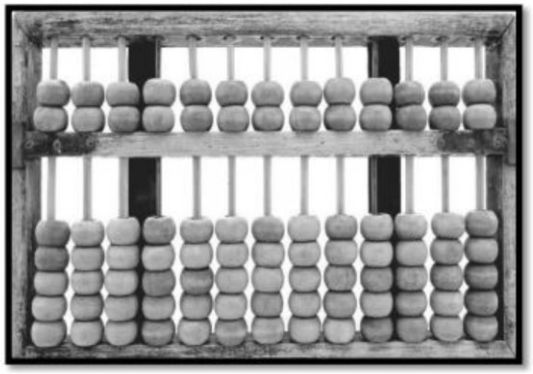
Searching the followings can avoid un-necessary ads from the search engines.

- **Your email**
- **Medical issues and drugs**
- **Your name**
- **Your location**
- **Your favorite things**

Roots of Computing

Abacus:

The machine is quite simple, consisting of beads strung on rods that are in turn mounted in a rectangular frame.



Technology of Gears

A few inventors began to experiment with the technology of gears. Among these were Blaise Pascal (**1623–1662)** of France, Gottfried Wilhelm Leibniz (**1646–1716)** of Germany, and Charles Babbage (**1792–1871)** of England. These machines represented data through gear positioning, with data being entered mechanically by establishing initial gear positions

Punch Cards

Herman Hollerith (1860–1929), who applied the concept of representing information as holes in paper cards to speed up the tabulation process in the **1890 U.S.** census.

Mechanical-driven to Electronics-driven machines

Figure 13: Punch Cards

ENIAC

More flexible machines, such as the ENIAC (electronic numerical integrator and calculator) developed by John Mauchly and J. Presper Eckert at the Moore School of Electrical Engineering

Factsheet of ENIAC

- Occupied 1800 square feet
- 20, 000 vacuum tubes
- 1500 relays
- 10, 000 capacitors
- 70, 000 registers
- 200 Kilo Watt electricity
- Weight 30tons
- Cost = $487, 000
- PKR = 62.5 millions

Rapid Advancement

i. **Transistor**
ii. **Integrated Circuits**
iii. **Size reduction**
iv. **Processing Power doubling in 2 years**
v. **Desktop computer**
vi. **IBM launched PC in 1981**
vii. **Web**
viii. **Smart Phones**

BITS

Bits In Computer, all kind of information is stored in bits. Bit is the basic unit of storage.

Basics

- **Information is coded as pattern of 0 or 1**
- **Short form of Binary Digits**
- **One bit can contain only one value 0 or 1**

Bits units

Table 1 shows the bits and their equivalent units.

Unit	Equivalent
1 Byte	8 bits
1 Kilo Byte (KB)	1024 Bytes
1 Mega Byte (MB)	1024 KB
1 Giga Byte (GB)	1024 MB
1 Tear Byte (TB)	1024 GB

Boolean Operations

To understand how individual bits are stored and manipulated inside a computer, it is convenient to imagine that the bit 0 represents the value false and the bit 1 represents the value true. Operations that manipulate true/false

1.AND Boolean Operation

It produces the output as 1 when both of the inputs are 1.

2. OR Boolean Operation

It produces output of 1 when any of the inputs are 1, otherwise 0

3.XOR Boolean Operation

XOR (Exclusive or) is another Boolean operation which produces the output of 1 when both inputs are different. It produces 0 when both inputs are same.

4. Not Operation

Not operation takes one input, produces 1 when input is 0 and produces 0.

Hexadecimal Notation

Merely transcribing the pattern 101101010011 is tedious and error prone. To simplify the representation of such bit patterns, therefore, we usually use a shorthand notation called hexadecimal notation.

storing a Bit

1. Main Memory

For the purpose of storing data, a computer contains a large collection of circuits (such as flip-flops), each capable of storing a single bit. This bit reservoir is known **as the machine's main memory**.

Memory Address

To identify individual cells in a Computer's main memory, each cell is assigned a unique **"name,"** called its address.

2.RAM

To reflect the ability to access cells in any order, a computer's main memory is often called **random access memory (RAM).**

3.DRAM

Dynamic ram – Stores bits as tiny electric Charge, refreshes many times a second.

4.SDRAM

applies additional techniques to decrease the time needed to retrieve the contents from its memory cells.

Optical System

Another class of mass storage system applies optical technology. An example is the compact disk (CD). Digital Versatile Disks (DVDs) and Blu-ray Disks (BDs) are also popular examples of optical systems

1. **Compact Disk**: 12 centimeter in diameter , Consists of reflective material
2. **DVD (Digital Versatile Disks)** :CDs capacity is 600 to 700 MB; however, DVD has space in GBs as have multiple semi-transparent layers.

3. **BDs (Blue Ray Disks)** BDs use a blue-violet spectrum of light (instead of red), which is able to focus its laser beam with very fine precision. BDs provide five-time capacity than DVDs.

Representing Images

1.Pixel

Collection of dots – Pixel short for Picture Element.

2.Pixel to Bitmap

In black and white images, each pixel is represented as one bit – e.g. 0 for black and 1 for white

3.Handling shades

8 bits are used instead of 1 bit to store the shades of grayness.

4.Colorful Images

RGB encoding ,One byte for Red, one byte for Green, and one-byte Blue

5.Brightness Chrominance

One brightness component and two-color components.

6.Image Scaling

Scaling to a larger size needs more pixels ,Digital Zoom.

Representing Sound

Sound Amplitude :

It is the extent to which air particles are displaced, and this amplitude of sound or sound amplitude is experienced as the loudness of sound.

Excess Notation

This is another method of representing integer values

- Integer Representations in Excess Notation
- Fixed number of bits to represent each value
- Write down all bit patterns of the same length
- First bit pattern having 1 in the most significant bit is used to represent Zero

Floating Point Notation

In contrast to the storage of integers, the storage of a value with a fractional part requires that we store not only the pattern of 0s and 1s representing its binary representation but also the position of the radix point.

Data Compression:

Generic Techniques Data compression schemes fall into two categories. Some are lossless, others are lossy. Lossless schemes are those that do not lose information in the compression process.

David Huffman is credited with discovering an algorithm that is commonly used for developing frequency-dependent codes, and it is common practice to refer to codes developed in this manner as **Huffman codes.**

Data Compression: Compressing Images

compression system for images is JPEG **(pronounced "JAY-peg").** It is a standard developed by the Joint Photographic Experts Group (hence the standard's name) within ISO.

Still another data compression system associated with images is TIFF **(short for Tagged Image File Format).**

Data Compression: Compressing Audio and Videos

The most commonly used standards for encoding and compressing audio and video were developed by the Motion Picture Experts Group (MPEG) under the leadership of ISO. In turn, these standards themselves are called **MPEG.**

The best-known system for compressing audio is MP3, which was developed within the **MPEG** standards.

Data Manipulation: CPU Basic

A CPU consists of three parts

1.arithmetic/logic unit:

which contains the circuitry that performs operations on data (such as addition and subtraction).

2. control unit

which contains the circuitry for coordinating the machine's activities.

3. register unit

which contains data storage cells (similar to main memory cells), **called registers**, that are used for temporary storage of information within the CPU. Some of the registers within the register unit are considered **general-purpose registers**, whereas others are **special-purpose registers**.

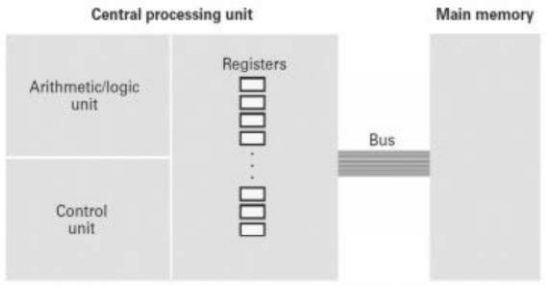


Figure 41: CPU and main memory connected via a bus

Data Manipulation: Stored Program

The idea of storing a computer's program in its main memory is called the stored-program concept.

Data Manipulation:Logic Bitwise

operations that combine two strings of bits to produce a single output string by applying the basic operation to individual columns.

For example, the result of ANDing the patterns **10011010 and 11001001** results .

Data Manipulation: Rotation and Shift

The operations in the class of rotation and shift operations provide a means for moving bits within a register and are often used in solving alignment problems.

One technique is to place the bit that fell off the right end in the hole at the left end. The result is a **circular shift**, also called a **rotation**.

Data Manipulation: Direct Memory Access and Handshaking

Since a controller is attached to a computer's bus, it can carry on its own communication with main memory during those nanoseconds in which the CPU is not using the bus. This ability of a controller to access main memory is known as **direct memory access (DMA).**

Data Manipulation: Communication media and communication rates

Communication between computing devices is handled over two types of paths:

- **Parallel communication**
- **Serial communication**

Operating Systems: History

Today's operating systems are large, complex software packages that have grown from humble beginnings. The computers of **the 1940s and 1950s** were not very flexible or efficient. Machines occupied entire rooms. Program execution required significant preparation of equipment in terms of mounting magnetic tapes, placing punched cards in card readers, setting switches, and so on.

In batch **processing systems,** the jobs residing in mass storage wait for execution in a job queue . A queue is a storage organization in which objects (in this case, jobs) are ordered in first-in, first-out **(abbreviated FIFO and pronounced "FI-foe") fashion.**

To accommodate these needs, new operating systems were developed that allowed a program being executed to carry on a dialogue with the user through remote terminals—a feature **known as interactive processing.**

Operating Systems: Basic Concepts (I)

- **Coordination with User**
- **Real-time Processing**
- **Interactive system and Real-time Processing**
- **Time Sharing**

Operating Systems: Basic Concepts (II)

With the development of multiuser, time-sharing operating systems, a typical computer installation was configured as a large central computer connected to numerous workstations.

multitasking capabilities by assigning different tasks to different processors as well as by sharing the time of each single processor. These operating systems must wrestle with such problems as **load balancing** (dynamically allocating tasks to the various processors so that all processors are used efficiently) as well as scaling **(breaking tasks into a number of subtasks compatible with the number of processors available).**

Operating Systems:Software Classification

Let us begin by dividing a machine's software into two broad categories: application software and system software . Application software consists of the programs for performing tasks particular to the machine's utilization.

Within the class of system software are two categories: One is the operating system itself and the other consists of software units collectively known as **utility software.**

Operating Systems: Components (I)

The portion of an operating system that handles this communication is often called the user interface. Older user interfaces, **called shells,** communicated with users through textual messages using a keyboard and monitor screen. More modern systems perform this task by means of a graphical user

interface (GUI—pronounced "GOO–ee") in which objects to be manipulated, such as files and programs, are represented pictorially on the display as icons.

Operating Systems: Components (II)

In contrast to an operating system's user interface, the internal part of an operating system is called the **kerne**l. An operating system's kernel contains those software components that perform the very basic functions required by the **computer installation.**

A chain of directories within directories is called a **directory path**. Paths are often expressed by listing the directories along the path separated by slashes.

Operating Systems: Process of Booting

We have seen that an operating system provides the software infrastructure required by other software units, but we have not considered how the operating system gets started. This is accomplished through a procedure known as **boot strapping** (often shortened to booting) that is performed by a computer each time it is turned on.

To resolve this dilemma, a small portion of a computer's main memory where the CPU expects to find its initial program is constructed from special nonvolatile memory cells. Such memory is known as **readonly memory (ROM)** because its contents can be read but not altered.

Operating Systems: Process and its Administration

- Coordinating Machine's activities
- Program vs Process

Process

The activity of executing a program under the control of the operating system is known as **a process.**

Associated with a process is the current status of the activity, called the **process state.**

Process state

- **The value of Program counter**
- **Values in other CPU registers**
- **Values in associated memory cell.**
- **Snapshot of the machine at particular time**.

Operating Systems: Process and its Administration

To keep track of all the processes, the scheduler maintains a block of information in main memory called the **process table.**

A process is ready if it is in a state in which its progress can continue; it is waiting if its progress is currently delayed until some external event occurs, such as the completion of a mass storage operation, the **pressing** of a key at the keyboard, or the arrival of a message from another process. The dispatcher is the component of the kernel that oversees the execution of the scheduled **processes.**

Each time the dispatcher awards a time slice to a process, it initiates a timer circuit that will indicate the end of the slice by generating a signal **called an interrupt**.

Operating Systems: Semaphores

A properly implemented flag, as just described, is **called a semaphore**, in reference to the railroad signals used to control access to sections of track. In fact, semaphores are used in software systems in much the same way as they are in railway systems.

Operating Systems: Deadlock

Another problem that can arise during resource allocation is **deadlock**, the condition in which two or more processes are blocked from progressing because each is waiting for a resource that is allocated to another.

The operating system would make the non-sharable resource appear sharable by creating the illusion of more than one printer. This technique of holding data for output at a later but more convenient time is called **spooling.**

Operating Systems: Security Attacks from outside

The operating system can then use this information during each login procedure (a sequence of transactions in which the user establishes initial contact with a computer's operating system) to control access to the system. Accounts are established by a person known as the super user or the administrator.

Operating Systems: Security Attacks from inside

To protect against such actions, CPUs for multiprogramming systems are designed to operate in one of two privilege levels; we will call one "privileged mode," the other we will call "non-privileged mode." When in privileged mode, the CPU is able to execute all the instructions in its machine language. However, when in non-privileged mode, the list of acceptable instructions is limited. The instructions that are available only in privileged mode are called **privileged instructions**.

Networking and the Internet:

Network Classification A computer network is ften classified as being either a personal area net- work **(PAN**), a local area network **(LAN),** a metropolitan area network **(MAN),** or a wide area network (WAN). A PAN is normally used for short- range communications—typically less than a few meters—such as between a wireless headset and a smartphone or between a wireless mouse and its PC.

Networking and the Internet:

Protocols For a network to function reliably, it is important to establish rules by which activities are conducted. Such rules are called **protocols.**

Networking and the Internet: Methods of Process Communication

Inter process communication (IPC) is used for exchanging data ... The Processes may be running on single or multiple computers connected by a network.

Networking and the Internet: Distributed Systems

Distributed networking, used in **distributed computing**, is the **network system** over which computer programming, software, and its data are spread out across more than one computer, but communicate complex messages through their nodes (computers), and are dependent upon each other.

Networking and the Internet: Internet Architecture

A s we have already mentioned, the Internet is a collection of connected net- works. In general, these networks are constructed and maintained by organizations called Internet Service Providers (ISPs)

Networking and the Internet: Internet Addressing

Internet needs an internet-wide addressing system that assigns a unique identifying address to each computer in the sys- tem. In the Internet these addresses are known as **IP addresses**.

Networking and the Internet: Internet Applications

As webservers and browsers have become more sophisticated, more and more of these traditional network applications have come to be handled by webpages via the powerful **Hyper Text Transfer Protocol (HTTP**).

Electronic Mail

A wide variety of systems now exist for exchanging messages between end users over the network; instant messaging (IM), browser-based online chatting, Twitter-based "tweets", and the Facebook "wall" are but a few.

Networking and the Internet: Internet Applications: Email

- **Messaging applications**
- **Instant Messaging**
- **Browser based chatting**
- **Twitter based tweets**
- **Facebook wall**
- **One of the oldest is Electronic mail (Email**

Protocol

Simple Mail Transfer Protocol (SMTP)

Other Protocols

- **SMTP for text messages**
- **MIME**
- **Post Office Protocol Version 3 (POP3)**

Networking and the Internet: Internet Multimedia Streaming

Streaming is an enabling technology for providing **multimedia** data delivery between clients in various **multimedia** applications on the **Internet.**

Networking and the Internet: World Wide Web

The **world wide web**, or **web** for short, are the pages you see when you're at a device and you're online. But the **internet** is the network of **connected** computers that the **web** works on, as well as what emails and files travel across..

Networking and the Internet: HTML

A traditional hypertext document is similar to a text file because its text is the HTML-encoded version (called the **source** version) of an extremely simple webpage is shown in Figure 68a. Note that the tags are delineated by the symbols < and >. The HTML source document consists of two sections—a head (surrounded by the <head> and </head> tags) and a body (surrounded by the

<body> and </body> tags). The distinction between the head and body of a web- page is similar to that of the head and body of an interoffice memo. In both cases, the head contains preliminary information about the document (date, subject, etc. in the case of a memo). The body contains the meat of the document, which in the case of a webpage is the material to be presented on the computer screen when the page is displayed.

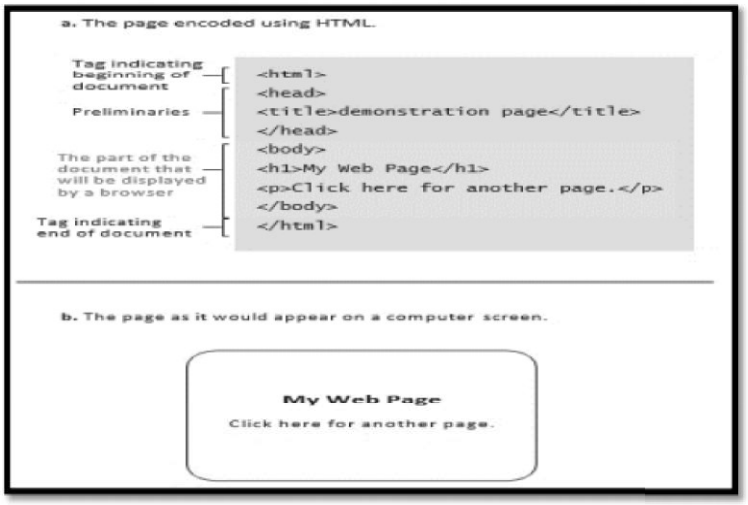


Figure 68: A simple webpage

Networking and the Internet: Client Side and Server Side

Client-side means that the action takes place on the user's (the **client's**) computer. **Server-side** means that the action takes place on a web **server**.

Networking and the Internet: Layered Approach to Internet Software (I)

The four layers are known as the application layer, the transport layer, the network layer, and the link layer.

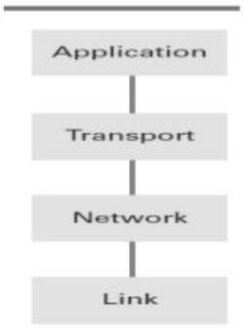


Figure 74: The Internet software layers

Networking and the Internet: TCP /IP Protocol Suite

The TCP/IP protocol suite is a collection of protocol standards used by the Internet to implement the four-level communication hierarchy. Actually, the **Transmission Control Protocol (TCP)** and the **Internet Protocol (IP)** are the names of only two of the protocols in this vast collection—so the fact that the entire collection is referred to as the TCP/IP protocol suite is rather misleading. More precisely, TCP defines a version of the transport layer. TCP(transmission control protocol)"

Networking and the Internet: Security (Forms of Attacks)

- Malware. Malware is a term used to describe malicious software, including spyware, ransomware, viruses, and worms. ...
- Phishing. ...
- Man-in-the-middle **attack**. ...
- Denial-of-service **attack**. ...
- SQL injection. ...
- Zero-day exploit.

Networking and the Internet: Protection and Cures

1. Rename routers and **networks**.
2. Use strong passwords.
3. Keep everything updated.
4. Turn on encryption.
5. Use multiple firewalls.
6. Turn off **the** WPS (Wi-Fi protected setup) setting.
7. Use a VPN (virtual private **network**).

Networking and the Internet: Encryption

Network encryption (sometimes called **network** layer, or **network** level **encryption**) is a **network** security process that applies crypto services at the **network** transfer layer - above the data link level, but below the application level.

Algorithm: Formal Definition of Algorithm

Formal Definition

An algorithm is an ordered set of unambiguous, executable steps that defines a terminating process.

Algorithm: Representation (Primitives)

The representation of an algorithm requires some form of language. In the case of humans, this might be a traditional natural language (English, Spanish, Russian, Japanese) or perhaps the language of pictures, as demonstrated.

Computer science approaches these problems by establishing a well-defined set of building blocks from which algorithm representations can be constructed. Such a building block is called a **primitive.**

A collection of primitives along with a collection of rules stating how the primitives can be combined to represent more complex ideas constitutes a **programming language.**

Algorithm: Algorithm Discovery Strategies

problem-solving approach is to look for a related problem that is either easier to solve or has been solved before and then try to apply its solution to the current problem. This technique is of particular value in the context of program development

Algorithm: Iterative Structures (Loop Control)

The repetitive use of an instruction or sequence of instructions is an important algorithmic concept. One method of implementing such repetition is the iterative structure known as the **loop**, in which a collection of instructions, called the body of the loop, is executed in a repetitive fashion under the direction of some **control process.**

Algorithm: Iterative Structures (Components of Repetitive Control)

The control of a loop consists of the three activities initialize, test, and modify , with the presence of each being required for successful loop control. The test activity has the obligation of causing the termination of the looping process by watching for a condition that indicates termination should take place. This condition is known as the **termination condition**.

Algorithm: Iterative Structures (Pretest and Posttest loops)

In a more generic context you might hear the while loop structure referred to as a pretest loop (since the test for termination is performed before the body is executed) and the repeat loop structure referred to as a posttest loop (since the test for termination is performed after the body is executed).

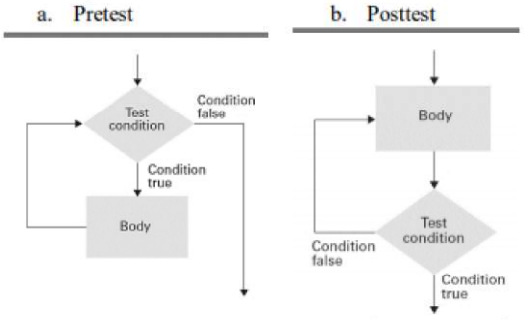


Figure 84: Pretest and Posttest loop

Algorithm: Recursive Structure (The Binary Search Algorithm)

Recursive structures provide an alternative to the loop paradigm for implementing the repetition of activities. Whereas a loop involves repeating a set of instructions in a manner in which the set is completed and then repeated, recursion involves repeating the set of instructions as a subtask of itself.

. Algorithm: Recursive Control

The binary search algorithm is similar to the sequential search in that each algorithm requests the execution of a repetitive process.

the binary search executes each stage of the repetition as a subtask of the previous stage. This technique is **known as recursion.**

In general, a recursive function is designed to test for the termination condition **(often called the base case or degenerative case)** before requesting further activations.

Algorithm: Algorithm Efficiency

Even though today's machines are capable of executing millions or billions of instructions each second, efficiency remains a major concern in algorithm design. Often the choice between efficient and inefficient algorithms can make the difference between a practical solution to a problem and an impractical one.

Algorithm: Software Verification

Recall that the fourth phase in Polya's analysis of problem solving (module 92) is to evaluate the solution for accuracy and for its potential as a tool for solving other problems.

"A traveler with a gold chain of seven links must stay in an isolated hotel for seven nights. The rent each night consists of one link from the chain. What is the fewest number of links that must be cut so that the traveler can pay the hotel one link of the chain each morning without paying for lodging in advance?"

Algorithm: Software Verification Examples

Software Verification?

Distinction between Program believed to be correct and the program that is correct.

Example #1 – Software Failure

- **Fatal Therac-25 X-ray Radiation**
- **In 1986, a man in Texas received between 16,500-25,000 radiations in less than 10 sec, over an area of about 1 cm.**
- **He passed away 5 months later.**
- **The root cause of the incident was a SW failure**

Introduction to Computing – CS101

Final term short notes

Programming Languages: Early Generations-I

programs for modern computers consist of sequences of instructions that are encoded as numeric digits. Such an encoding system is known as a machine language.

Unfortunately, writing programs in a machine language is a tedious task that often leads to errors that must be located and corrected (a process known as debugging) before the job is finished.

MOV R5, R6

As a more extensive example, the machine language routine

156C

166D

5056

306E

C000

which adds the contents of memory cells 6C and 6D and stores the result at location 6E (Figure 46) might be expressed as :

LD R5,

Price LD R6,

ShippingCharge

ADDI R0,

R5 R6 ST R0,

TotalCost

HLT

using mnemonics. (Here we have used LD, ADDI, ST, and HLT to represent load, add, store, and halt. Moreover, we have used the descriptive names Price, ShippingCharge, and TotalCost to refer to the memory cells at locations 6C, 6D, and 6E, respectively. Such descriptive names are often called program variables or identifiers.)

Programming Languages: Early Generations-II

Once such a mnemonic system was established, programs called assemblers were developed to convert mnemonic expressions into machine language instructions.

A mnemonic system for representing programs is collectively called an assembly language. Although assembly languages have many advantages over their machine language counterparts, they still fall short of providing the ultimate programming environment.

Another disadvantage of an assembly language is that a programmer, although not required to code instructions in numeric form, is still forced to think in terms of the small, incremental steps of the machine's language.

The result was the emergence of a third generation of programming languages that differed from previous generations in that their primitives were both higher level (in that they expressed instructions in larger increments) and machine independent (in that they did not rely on the characteristics of a particular machine). The bestknown early examples are **FORTRAN (FORmula TRANslator)**, which was developed for scientific and engi- neering applications, and COBOL **(COmmon Business-Oriented Language),** which was developed by the U.S. Navy for business applications.

Translator: Once this collection of high-level primitives had been identified, a program, called a translator, was written that translated programs expressed in these high-level primitives into machine-language programs.

Comepiler:

instructions into short sequences to simulate the activity requested by a single high-level primitive. Thus, these translation programs were often called compilers.

Interpreters:

An alternative to translators, called interpreters, emerged as another means of implementing thirdgeneration language.

Programming Languages: Machine Independence

With the development of third-generation languages, the goal of machine independence was largely achieved. Since the statements in a third-generation language did not refer to the attributes of any particular machine, they could be compiled as easily for one machine as for another.

Programming Languages: Imperative Paradigms

The generation approach to classifying programming languages is based on a linear scale. , the development of programming languages has not progressed in this manner but has developed along different paths as alternative approaches to the programming process **(called programming paradigms)** have surfaced and been pursued.

The **imperative paradigm**, also known as the procedural paradigm, represents the traditional approach to the programming process. It is the paradigm on which Python and our pseudocode are based as well as the machine language. As the name suggests, the imperative paradigm defines the programming process to be the development of a sequence of commands that, when followed, manipulate data to produce the desired result. Thus, the imperative paradigm tells us to approach the programming process by finding an algorithm to solve the problem at hand and then expressing that algorithm as a sequence of commands.

Programming Languages: Declarative Paradigms

In contrast to the imperative paradigm is the declarative paradigm, which asks a programmer to describe the problem to be solved rather than an algorithm to be followed. More precisely, a declarative programming system applies a pre-established general-purpose problem-solving algorithm to solve problems presented to it.

The result has been increased attention to the declarative paradigm and the emergence of **logic programming.**

Programming Languages: Functional Paradigm

Another programming paradigm is the functional paradigm. Under this paradigm a program is viewed as an entity that accepts inputs and produces outputs. Mathematicians refer to such entities as functions, which is the reason this approach is called **the functional paradigm**.

Programming Languages: Object Oriented Paradigm

Another programming paradigm (and the most prominent one in today's software development) is the **object-oriented paradigm**, which is associated with the programming process called **object-oriented programming (OOP)**. Following this paradigm, a software system is viewed as a collection of units, called objects, each of which is capable of performing the actions that are immediately related to itself as well as requesting actions of other objects.

Each of these objects would encompass a collection of functions **(called methods in the objectoriented vernacular)** This description of the object's properties is called a class. Once a class has been constructed, it can be applied anytime an object with those characteristics is needed.

Programming Languages: Variable and Data Types

High-level programming languages allow locations in main memory to be referenced by descriptive names rather than by numeric addresses. Such a name is known as a variable, in recognition of the fact that by changing the value stored at the location, the value associated with the name changes as the program executes.

Programming Languages: Data Structure

In addition to data type, variables in a program are often associated with data structure, which is the conceptual shape or arrangement of data.

One common data structure is the array, which is a block of elements of the same type such as a one dimensional list, a two-dimensional table with rows and columns, or tables with higher dimensions.

Programming Languages: Assignment Statement:

The most basic imperative statement is the assignment statement, which requests that a value be assigned to a variable **(or more precisely, stored in the memory area identified by the variable).**

Programming Languages: Control Structures

(if-statement) A control statement alters the execution sequence of the program. Of all the programming constructs.

```
if (condition)
    StatementA
Else
    StatementB
```

Programming Languages: Control Structures (Loops)

There is another type of control structure known as loop. The loop control structure iterates a set of instructions based on the provided condition.

Programming Languages: Programming Concurrent Activities

Such simultaneous execution of multiple activations is called parallel processing or concurrent processing.

True parallel processing requires multiple CPU cores, one to execute each activation. When only one CPU is available, the illusion of parallel processing is obtained by allowing the activations to share the time of the single processor in a manner similar to that implemented by multiprogramming systems.

Programming Languages: Arithmetic Operators

Examples

C-language has the following arithmetic operators:

+ Addition

- Subtraction

*** Multiplication**

/ Division

% Modulus

Programming Languages: Relational Operators Examples

C-language has the following relational operators:

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

C++ Relational Operators are used to compare values of two variables. Here in example we used the operators in if statement.

Programming Languages: Logical Operators Examples

1. C-language Logical Operators are used if we want to compare more than one condition.

2. Depending upon the requirement, proper logical operator is used. 3. Following table shows us the different C++ operators available.

Operators	Name of the Operator	Type
&&	AND Operator	Binary
||	OR Operator	Binary
!	NOT Operator	Unary

According to names of the Logical Operators, the condition satisfied in following situation and expected outputs are given

Operator	Output
AND	Output is 1 only when conditions on both sides of Operator become True
OR	Output is 0 only when conditions on both sides of Operator become False
NOT	It gives inverted Output

Software Engineering: Requirement Analysis Phase

Requirements Analysis: The software life cycle begins with requirements analysis— the goal of which is to specify what services the proposed system will provide, to identify any conditions (time constraints, security, and so on) on those services, and to define how the outside world will interact with the system.

Software Engineering: Design Phase

Whereas requirements analysis provides a description of the proposed software product, design involves creating a plan for the construction of the proposed system.

Techniques for developing these plans have evolved over many years and include standardized notational systems and numerous modeling and diagramming methodologies

Software Engineering: Implementation Phase

Implementation involves the actual writing of programs, creation of data files, and development of databases. It is at the implementation stage that we see the distinction between the tasks of a software analyst (sometimes referred to as a system analyst) and a programmer.

Software Engineering: Testing Phase

Programs are not the only artifacts that are tested during the software development process. Indeed, the result of each intermediate step in the entire development process should be **"tested"** for accuracy. Testing is now recognized as only one segment in the overall struggle for quality assurance, which is an objective that permeates the entire software life cycle.

"**requirements analysis and confirmation," "design and validation," and "implementation and testing."**

Software Engineering: Software Engineering Methodologies (I)

Early approaches to software engineering insisted on performing requirements analysis, design, implementation, and testing in a strictly sequential manner. The belief was that too much was at risk during the development of a large software system to allow for variations.

Another model that represents the shift away from strict adherence to the waterfall model is the iterative model, which is similar to, and in fact sometimes equated with, the incremental model, although the two are distinct.

Whereas the incremental model carries the notion of extending each preliminary version of a product into a larger version, the iterative model encompasses the concept of refining each version.

Software Engineering: Software Engineering Methodologies (II)

Incremental and iterative models sometimes make use of the trend in software development toward prototyping in which incomplete versions of the proposed system, called prototypes, are built and evaluated.

A less formal incarnation of incremental and iterative ideas that has been used for years by computer enthusiasts/hobbyists is known **as open-source development**.

Software Engineering: Coupling

a goal when designing a modular system should be to maximize independence among modules or, in other words, to minimize the linkage between modules **(known as intermodule coupling).**

One is control coupling, which occurs when a module passes control of execution to another, as in a **function call.**

Another form of intermodule coupling **is data coupling**, which refers to the sharing of data between modules.

Software Engineering: Cohesion

The term cohesion refers to this internal binding or, in other words, the degree of relatedness of a module's internal parts.

Thus, in addition to seeking low intermodule coupling, software designers strive for high intramodule cohesion. A weak form of cohesion is known as **logical cohesion**.

A stronger form of cohesion is known as functional cohesion, which means that all the parts of the module are focused on the performance of a **single activity.**

Software Engineering: Information Hiding

One of the cornerstones of good modular design is captured in the concept of information hiding, which refers to the restriction of information to a specific portion of a software system. Here the term information should be interpreted in a broad sense, including any knowledge about the structure and contents of a program unit. As such, it includes data, the type of data structures used, encoding systems.

Software Engineering: Components

The modular approach to software development promises hope in this regard. In particular, the object-oriented programming paradigm is proving especially useful because objects form complete, self-contained units that have clearly defined interfaces with their environments. Once an object, or more correctly a class.

Thus, an object is actually a special case of the more general concept of a component, which is, by definition, a reusable unit of software.

Research in the development and use of components has led to the emerging **field known as component** architecture (**also known as component-based software engineering**) in which the traditional role of a programmer is replaced by a component assembler who constructs software systems from prefabricated **components that, in** many development environments, are displayed as icons in a graphical interface.

Software Engineering: Design Patterns

An increasingly powerful tool for software engineers is the growing collection of design patterns. A design pattern is a pre-developed model for solving a recurring problem in software design. For example, the Adapter pattern provides a solution to a problem that often occurs when constructing software from **prefabricated modules**.

Software Engineering: Software Testing

Whereas software quality assurance is now recognized as a subject that permeates the entire development process, testing and verification of the programs themselves continues to be a topic of research. In module 107, we discussed techniques for verifying the correctness of algorithms in a mathematically rigorous manner but concluded that most software today is **"verified"** by means of testing.

Software Engineering: Documentation

The purpose of system documentation is to describe the software's internal composition so that the software can be maintained later in its life cycle. A major component of system documentation is the source version of all the programs in the system.

Data Abstraction: Arrays and Aggregates

Recall that an array is a "rectangular" block of data whose entries are of the same type. The simplest form of array is the one-dimensional array, a single row of elements with each position identified by an index.

In contrast to an array, recall that an aggregate type is a block of data items that might be of different types and sizes. The items within the block are usually **called fields.**

Data Abstraction: List, Stacks and Queues

Another basic data structure is a list, which is a collection whose entries are arranged sequentially . The beginning of a list is called the **head** of the list. The other end of a list is called the **tail.**

A stack is a list in which entries are inserted and removed only at the head. An example is a stack of books where physical restrictions dictate that all additions and deletions occur at the top . Following colloquial terminology, the head of a stack is called the top of the stack. The tail of a stack is called its bottom or base.

Data Abstraction: Trees

A tree is a collection whose entries have a hierarchical organization similar to that of an organization chart of a typical company (Figure 105). The president is represented at the top, with lines branching down to the vice presidents, who are followed by regional managers, and so on.

Data Abstraction: Pointer

A pointer is a storage area that contains such an encoded address. In the case of data structures, pointers are used to record the location where data items are stored.

Thus, the program counter plays the role of a pointer. In fact, another name for a program counter is **instruction pointer.**

Database Systems: Role of Schema

A schema is a description of the entire database structure that is used by the database software to maintain the database. A subschema is a description of only that portion of the database pertinent to a particular user's needs.

Database Systems: Database Management Systems

e. The actual manipulation of the database is accomplished by the database management system (DBMS).

For instance, with a well-designed DBMS, the application software does not have to be concerned with whether the database is stored on a single machine or scattered among many machines within a

network as a distributed database. Instead, the DBMS would deal with these issues, allowing the application soft- ware to access the database without concern for where the data is actually stored.

Still another reason for separating the user interface and actual data manipulation into two different software layers is to achieve data independence—the ability to change the organization of the database itself without changing the **application software**.

Database Systems: Relational Database model

, a DBMS contains routines that translate commands stated in terms of a conceptual view of the database into the actions required by the actual data storage system. This conceptual view of the database is called a **database model.**

Relational database model portrays data as being stored in rectangular tables, **called relations.**

Database Systems: project Operation

In contrast to the SELECT operation, which extracts rows from a relation, the PROJECT operation extracts columns. Suppose, for example, that in searching for the job titles in a certain department, we had already selected the tuples from the JOB relation that pertained to the target department and placed these tuples in a new relation called NEW1.

Database Systems: Join Operation

Another operation used in conjunction with relational databases is the JOIN operation. It is used to combine different relations into one relation. The JOIN of two relations produces a new relation whose attributes consist of the attributes from the original relations.

Database Systems: Object Oriented Databases

Another database model is based on the object-oriented paradigm. This approach leads to an object-oriented database consisting of objects that are linked to each other to reflect their relationships.

An object from the Employee class could contain such entries as **EmpIId, Name, Address, and SSNum;**

Database Systems: The Commit/Rollback Protocol

The point at which all the steps in a transaction have been recorded in the log is called the commit point.

the DBMS might find itself with a partially executed transaction that cannot be completed. In this case the log can be used to roll back.

Database Systems: Sequential Files

A sequential file is a file that is accessed in a serial manner from its beginning to its end as though the information in the file were arranged in one long row. Examples include audio files, video files, files

containing programs, and files containing textual documents. In fact, most of the files created by a typical personal computer user are sequential files.

Database Systems: Hash Files

Hashing is a technique that provides similar access without such overhead. As in the case of an indexed system, hashing allows a record to be located by means of a key value. But, rather than looking up the key in an index, hashing identifies the location of the record directly from the key.

Database Systems: Data Mining

Data mining has become an important tool in numerous areas including marketing, inventory management, quality control, loan risk management, fraud detection, and investment analysis. Data mining techniques even have applications in what might seem unlikely settings as exemplified by their use in identifying the functions of particular genes encoded in DNA molecules and characterizing properties of organisms.

Artificial Intelligence: Introduction and Vision

Artificial intelligence is the field of computer science that seeks to build autonomous machines - machines that can carry out complex tasks without human intervention. AI is helping to make Robots as shown in the Figure 123, and self-driving cars as shown in the Figure 124.

Figure 123: Robot

Figure 124: Self Driving Cars

Robots can help patients, for example one typical robot shown in the Figure 125 can alleviate a person even 40 times a day.

Artificial Intelligence: Intelligent Agents

An agent is a "device" that responds to stimuli from its environment. It is natural to envision an agent as an individual machine such as a robot, although an agent may take other forms such as an autonomous airplane, a character in an interactive video game, or a process communicating with other processes over the Internet (perhaps as a client, a server, or a peer).

Artificial Intelligence: The Turing Test

In the past the Turing test (proposed by Alan Turing in 1950) has served as a benchmark in measuring progress in the field of artificial intelligence. Today the significance of the Turing test has faded although it remains an important part of the artificial intelligence folklore.

CS Impact: CS impact on Society

Computer Science has impacted lives of humans largely. In this module we will learn the positive and negative impacts of CS on our society.

Positive impact of CS:

- It has improved the communication between people.
- Increased access to educational information via the Internet
- Increased productivity of people as now their manual work has reduced significantly.
- Exponential business growth
- Faster response times (for example, email, instant messaging and chat)

Negative Impact:

- People are working in sitting position and thus have more chance to develop obesity.
- Exposure to inappropriate material via the Internet
- Increased crime and access to private information
- Hacking bank account and transfer money to your account

CS Impact: CS Impact on Health

Computer Science has both positive and negative impacts on health.

Positive impact

- Easy access to online health centers
- We can take online appointment

Negative impact

- Computer wrists – Typing too much. This creates issues in the hands.
- Eyesight – eye is not meant to look 2D for long amount of time. This increases the risk of eye diseases.
- Hearing loss is more common in those listening to high volume music on computer.
- Social Isolation
- Communication Issues

CS Impact: Security Computer

security, also known as cyber-security or IT security, is the protection of information systems from theft or damage to the hardware, the software, and to the information on them, as well as from disruption or misdirection of the services they provide.

What are the concerns of computer security?

Computer Security is concerned with four main areas:

1. Confidentiality:- Only authorized users can access the data resources and information.

2. Integrity:- Only authorized users should be able to modify the data when needed.

3. Availability:- Data should be available to users when needed.

4. Authentication:- are you really communicating with whom you think you are communicating with

CS Impact: Privacy

Individual's right to own the data generated by his or her life and activities, and to restrict the outward flow of that data. Privacy uses the theory of natural rights, and generally responds to new information and communication technologies.

From where data comes from:

- ✓ Social Sites (Facebook, twitter)
- ✓ Telephone companies (mobile networks)
- ✓ Smart city cameras on road
- ✓ Emails

How to handle on internet

- ✓ Emails can be encrypted
- ✓ Anonymizing proxies
- ✓ Anonymizing networks

CS Impact: Social Issues of IT

The growth in the availability of affordable computing technology has caused a number of major shifts in the way that society operates.

analyze these and assess the severity of their impact so that steps can be taken to better understand and combat the negative effects.

- **Communication Breakdown**
- **Defamation of Character**
- **Identity Theft**
- **Cyber Bullying**
- **Gaming Addiction**
- **Privacy**

CS Impact: Content Filtering, Email-Spams and Laws

Content filtering, in the most general sense, involves using a program to prevent access to certain items, which may be harmful if opened or accessed. The most common items to filter are executable, emails or websites

Spam emails

As email spam continues to become a major issue, governments around the world have put specific regulations in place to protect their citizens from spams.

Important Laws

- CAN-SPAM Act in US
- Canada's Anti-Spam Legislation (CASL)
- Anti-spam law in Europe
- Spam Act of 2003 in Australia

Major requirements

- Ask for permission before adding emails
- User could identify you as Sender
- Do not give email address to others
- Be honest

CS Impact: Children Protection and Electronic Theft

There are lots of reasons why people start using parental controls. Perhaps to stop late night phone checking. Perhaps to help stop arguments when it's time put the iPad down and get on with homework. Maybe to reduce the total amount of time being spent on screens in general.

The following risks are involved in such scenarios:

- ✓ **Content Risks.**
- ✓ **Contact Risks**
- ✓ **Online Marketing**
- ✓ **Overspending**

Content Risks

- ✓ Illegal Content
- ✓ Harmful Content
- ✓ Harmful Advice

Contact Risks

- ✓ Online Harassment
- ✓ Cyberbullying
- ✓ Illegal interactions

Problematic content sharing

Online Marketing

- ✓ Inappropriate or unsuitable products
- ✓ Illegal and Age-restricted products

Word Processing: MS Word

Start menu launch ms word.

Click mc word

Ms word opn

Mini Tool Bar

The Mini Toolbar appears automatically whenever you select text and contains common text formatting commands as shown in the Figure 138. To Use the Mini Toolbar: Select the text you want to format and click the desired command on the Mini Toolbar. Click anywhere outside the Mini Toolbar to close it.

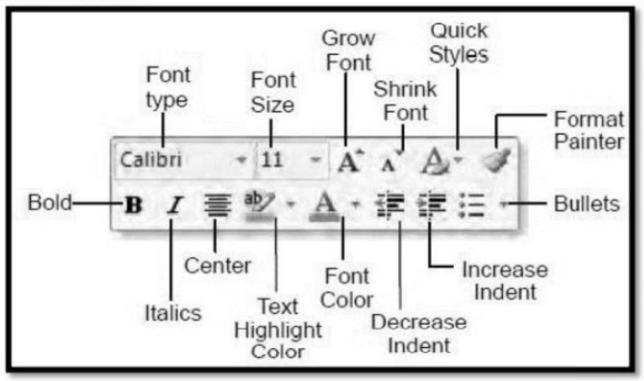


Figure 138: Mini Toolbar

188. Word Processing: MS Word (Quick Access bar)

The Quick Access Toolbar (Figure 139) provides easy access to the commands you use most frequently. The Save, Undo, Redo/Repeat, and Quick Print buttons appear on the Quick Access Toolbar by default, but you can add and remove commands to meet your needs. You can quickly reverse most commands you execute by using Undo. If you then change your mind again, and want to reapply a command, you can use Redo as shown in the Figure 139.

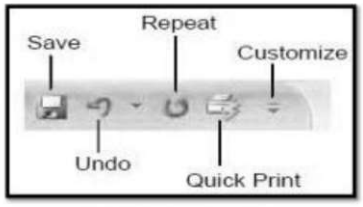


Figure 139: Quick Access toolbar

Exercise

1. Type word "Undo example".
2. Click the Undo button on the Quick Access menu. The typing disappears.
3. Click the Redo button on the Quick Access menu. The typing reappears.
4. Select "Undo example."
5. Press Ctrl+b to bold. Word bolds the text.
6. Press Ctrl+i. Word italicizes the text.
7. Press Ctrl+u Word underlines the text.
8. Click the down arrow next to the Undo icon. You will see the actions you performed listed. To undo the underline, click Underline; to undo the underline and italic, click Underline Italic; to undo the underline, italic, and bold click Bold etc.
9. To redo, click the Redo icon several times.

Alternate Method -- Undo & Redo by Using Keys

1. Type word "Undo example".
2. Press Ctrl+z. The typing disappears.
3. Press Ctrl+y. The typing reappears.
4. Select "Undo example."
5. Press Ctrl+u to underline.
6. Press Ctrl+z. The underline is removed.
7. Press Ctrl+y. The underline reappears.

Word Processing: MS Word (Home Ribbon)

The home ribbon is one of the most important ribbon available in the MS Word. Figure 140 shows the home ribbon. It contains different important groups such as: Clipboard, Font, Paragraph, Styles and Editing.

Word Processing: MS Word (Clipboard Group)

The Home ribbon is made up of the most used commands in Word. The first group on the Home ribbon is the Clipboard. Copy, Cut, Paste and Format Paste are the commands within the Clipboard group as shown in the Figure 141. The Clipboard commands are on the Home ribbon of Word and all other Office 2007 applications that use the ribbon. The dialog expander arrow of the Clipboard group will open up the Clipboard pane, showing all items that can be pasted.

191. Word Processing: MS Word (Font Group)

The second group of commands on the Home ribbon is the Font group. The font group commands are format enhancing tool that includes font typefaces, font size, font effects (bold, italics, underline, etc.), colors and more. Remember that you can preview how the new font will look by highlighting the text, and hovering over the new font typeface as shown in the Figure 146. The expander arrow in the Font group will open up the Font dialog window.

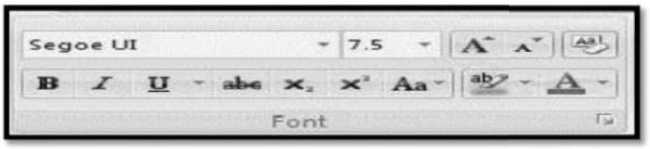


Figure 146: Font group

7.1.1 Basic Text Editing (Font Group Task)

Type your name in document window at insertion point as shown below in the Figure 147.

Word Processing: MS Word (Paragraph Group-I)

The third group on the Home ribbon is the Paragraph group. The paragraph group allows you to change Paragraph Alignment (left, right, centered, or justified), adjust Line Spacing within a paragraph, and adjust spacing before and after paragraphs.

Word Processing: MS Word (Paragraph Group-II) You can create your own bullet library. Perform the following steps:

1.Type the following list as shown:

Apple

Orange

Grape

Mango

Cherry

Word Processing: MS Word (Style Group)

A style is a set of formatting characteristics, such as font name, size, color, paragraph alignment and spacing. Some styles even include borders and shading. For example, instead of taking three separate steps to format your heading as 16-point, bold, Cambria, you can achieve the same result in one step by applying the built-in Heading 1 style.

196. Word Processing: MS Word (Insert Functionalities)

Insert Tab can be used if you want to add to graphics or link your document with another document. The initial part of the insert tab in word ribbon has been shown in the Figure 158.

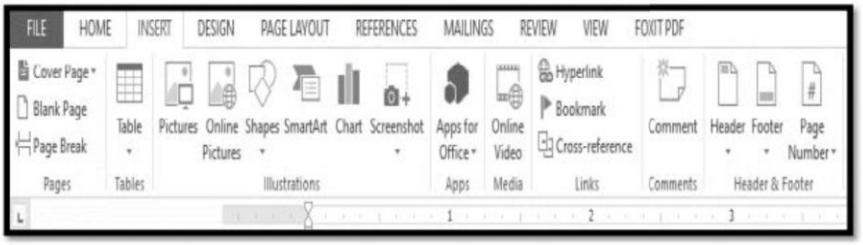


Figure 158: Inert tab

In the insert tab, the following groups are available which will be covered in the next modules:

- ✓ Pages Group
- ✓ Tables Group
- ✓ Illustrations Group
- ✓ Media
- ✓ Links
- ✓ Comments
- ✓ Header & Footer
- ✓ Text
- ✓ Symbols

Word Processing: MS Word (Editing Group)

Under the Find command, there is the Go To command. The Go To command can be used to immediately go to a page, a section or any marked location within your document.

The Select command can be used for different purpose.

- **To select all of the text in the document, click Select All.**
- **To select shapes that are hidden, stacked, or behind text, click Select Objects, and then draw a box over the shapes.**

- **To select text with similar formatting, click Select Text with Similar Formatting**

196. Word Processing: MS Word (Insert Functionalities)

Insert Tab can be used if you want to add to graphics or link your document with another document. The initial part of the insert tab in word ribbon has been shown in the Figure 158.

Figure 158: Inert tab

In the insert tab, the following groups are available which will be covered in the next modules:

1. Pages Group
2. Tables Group
3. Illustrations Group
4. Media
5. Links
6. Comments
7. Header & Footer
8. Text
9. Symbol

201. Word Processing: MS Word (Comments and Header & footer)

Header and Footers are areas where you can add Text or Graphics. Any formatting applied in these areas will be shown throughout the document. A header is at the top margin; a footer is printed in the bottom margin For Example observer the top of this page and all the pages in the document you will see same header and footer format.

Figure 175: Header and Footer

Word Processing: MS Word (Text Group (Part-II) and Symbols Group)

Drop Cap A drop cap is a specially formatted letter that appears at the beginning of a paragraph just like you see in newspapers or in books. Microsoft word offers drop caps in two styles. Most commonly used drop cap begins the paragraph with a large letter that spills down into the text. Thus, the drop cap shifts the first few lines of the paragraph.

Exercise: How to Use Drop Cap

1. Type the paragraph as you normally would.

2. Open the Insert tab on the Ribbon and click the Drop Cap button.(Figure 181)

3. Choose the drop cap style you want to use.

4. Adjust the drop cap, if you want to.

Word Processing: MS Word (Design Ribbon)

Figure 182: Design Ribbon

Style Set - Change the look of your document by choosing a new style set. Style sets change the font and paragraph properties of your entire document.

Colors - Drop-Down. Displays a list of all the available colors and lets you change the color component of the active theme.

Fonts - Drop-Down. Displays a list of all the available fonts and lets you change the font component of the active theme.

Paragraph Spacing - Drop-Down. Quickly change the line and paragraph spacing in your document. The drop-down contains the commands: No Paragraph Space, Compact, Tight, Open, Relaxed, Double, Custom Paragraph Spacing.

Effects - Drop-Down. Displays a list of all the available effects and lets you change the effect component of the active theme. The drop-down contains the commands: Office, Apex, Aspect, Civic, Concourse, Equity, Flow, Foundry, Median, Metro, Module, Opulent, Oriel, Origin, Paper, Solstice, Technic, Trek, Urban and Verve.

Set As Default - Use the current look for all new documents.

Watermarks

Watermarks in the documents can be attractive, but they aren't just about looks: A watermark can be a way of letting the reader know that the document is confidential.

Word Processing: MS Word (Compare and Protect Groups in Review Ribbon)

Compare - Drop-Down. The drop-down contains the commands: Compare and Combine. The Compare command lets you compare two versions of the same document and displays the

"Compare Documents" dialog box. The Combine command lets you combine revisions from multiple authors and displays the "Combine Documents" dialog box. This drop-down is disabled when the document is protected. The protect group is shown in the Figure 197.

Block Authors - Drop-Down. Prevent others from making changes to the selected text.

Restrict Editing - Toggles the display of the Restrict Editing task pane.

Presentations: MS-PowerPoint (Introduction)

Microsoft offers another powerful tool known as MS-PowerPoint. This is used to develop presentations. Microsoft PowerPoint is an easy program to use and a powerful tool for giving a presentation. Whether your presentation needs a visual kick, tools for collaboration, easy access or the ability to share information beyond the initial meeting, PowerPoint is a good option.

Figure 202: MS: Powerpoint

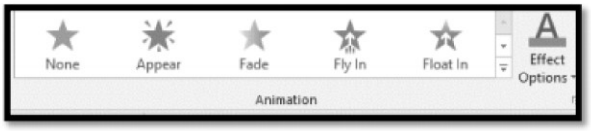
Presentations: MS-PowerPoint (Slides Group on Home Ribbon)

New Slide - Button with Drop-Down. The button inserts a new blank Title and Content Slide. The dropdown contains the slides: Title Slide, Title and Content, Duplicate Selected Slides, Slides from Outline and Reuse Slides. **Layout - Drop-Down**.

The drop-down contains the commands: Title Slide and Title and Content. **Reset -** Reset the position, size and formatting of the slide placeholders to their default settings**. Delete - Removes** the slides currently selected.

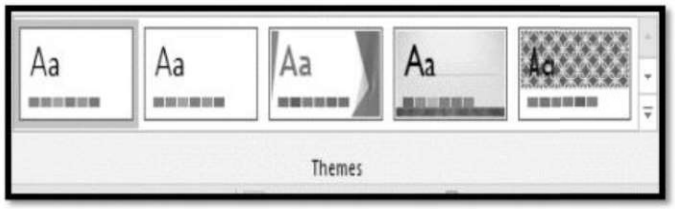
Presentations: MS-PowerPoint (Animation Ribbon

Transition discussed in the last module were the animations added in between slides. Whereas, If you want to animate text, an image, shape, graph or chart within the slide, this is the type of animation you select.



Presentations: MS-PowerPoint (Design Ribbon)

The design ribbon is the ribbon that helps you to design your slides as per your requirement. The first group is called the: "Themes" as shown in the Figure 204. This helps to choose the required theme of your presentation. You can try different themes to see the difference.



Spreadsheets: MS Excel (Introduction)

Spreadsheet is a tool that is used to organize data, such as a check register. Spreadsheets have been used for many, many years in business to keep track of expenses and other calculations.

Electronic Spreadsheet:

Microsoft Excel is an example of spreadsheet application program that can be used for storing, organizing and manipulating data. The key benefit to using a spreadsheet program is that you can make changes easily, including correcting spelling or values, adding, deleting and formatting.

Cell Formatting

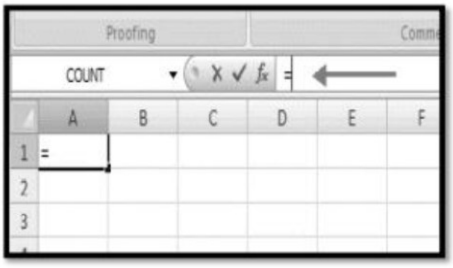
The cell formatting is show in the Figure 2010. You can adjust the row height by clicking "Auto fit row height". This will adjust the height of all the cells in a row according to the font size of the data you have inserted.

Charts

Charts allow you to present information contained in the worksheet in a graphic format. Excel offers many types of charts including: Column, Line, Pie, Bar, Area, Scatter and more. To view the charts available click the Insert Tab on the Ribbon.

Spreadsheets: MS Excel (Functions)

A formula is a set of mathematical instructions that can be used in Excel to perform calculations. Formals are started in the formula box starting with an = sign.



Calculate with Functions

A function is a built in formula in Excel. A function has a name and arguments (the mathematical function) in parentheses.

- ✓ **Sum:** Adds all cells in the argument
- ✓ **Average:** Calculates the average of the cells in the argument

- ✓ **Min**: Finds the minimum value
- ✓ **Max:** Finds the maximum value

Count: Finds the number of cells that contain a numerical value within a range of the argument

To calculate a function:

- ✓ Click the cell where you want the function applied
- ✓ Click the Insert Function button
- ✓ Choose the function
- ✓ Click Ok

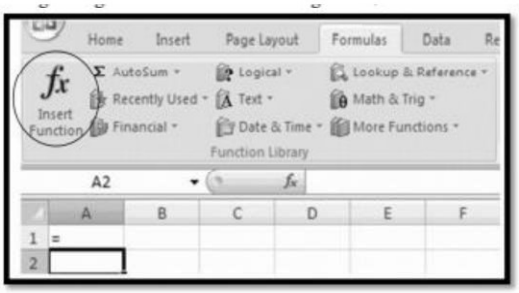


Figure 218: Function Computation

Spreadsheets: MS Excel (Application Scenarios-I)

After learning the formulas in details in the last module. Lets apply those in the real scenario.

Consider the Figure 219 which contains the data of five students and their marks in five subjects. We want to add the total marks of each student. The formula has been written for your reference.

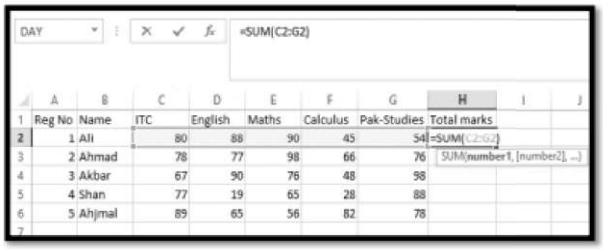
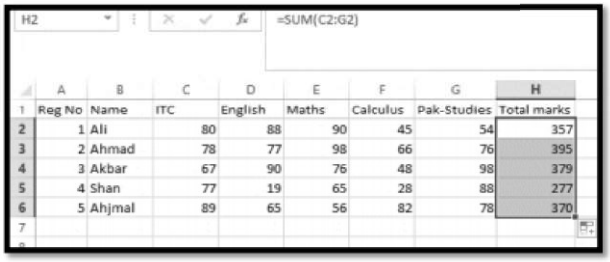


Figure 219: Sum of marks

When this formula is applied and copied in the following cells, the result can be seen in the Figure 220.



Spreadsheets: MS Excel (Sorting and Filter)

Sorting and Filtering allow you to manipulate data in a worksheet based on given set of criteria. You can sort the data in ascending and descending order. There are two types of sorts in Microsoft Excel i.e. Basic Sorts and Custom Sorts.

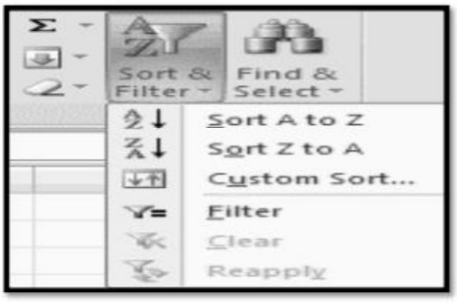


Figure 225: Sort and Filter

Custom Sort To sort on the basis of more than one column:

- **Click the Sort & Filter button on the Home tab**
- **Choose which column you want to sort by first**
- **Click Add Level**
- **Choose the next column you want to sort**
- **Click OK**

Database: MS Access (Introduction)

Commented [TS1]:

Database is collections of files which are also referred as tables. Information is organized in these tables in the form of fields and records for easy access and management purpose. SQL stands for structured query language. In order to access and retrieve data from the database we use SQL. This is the most commonly used syntax for querying a relational database. It is important to understand the difference between Database and DBMS.

To create a new database

- ✓ Click on Blank database option as shown in Figure 228
- ✓ Type Database name and browse to location where you save the new database.

Click Create button to create database. (Figure 229).

Figure 228: Create Blank Database

External data

External data tab is used to import, export, collect and share data between different databases.

Database: MS Access (Creating and Managing Tables)

Tables Group

Tables in Access are used to store data. It is a set of columns and rows. Each column in table is referred to as a field. Each value in the field signifies a single type of data. Numbers of Record are number of rows in a Table hence each row of a table is referred to as a single record.

Database: MS Access (Creating Forms)

Forms option provides you the ability to enter new record and navigate through existing records easily. You can arrange fields in different layouts add Icon and also apply designs as can be seen in the Figure 232.

Creating Form for Student Table

1. Select student table. Double click to open.
2. Click Create tab.
3. From the Forms group Select Form (Figure 232).
4. A Form will be created with Table Fields as Labels followed by Text Boxes (Figure 233)
5. Use Crtl+ S key to Save or right click on form tab "student" and select save.
6. In the popup dialogue box enter form name "studentForm" and click OK.
7. Your newly created form will show in Navigation Pane.(Figure 234)

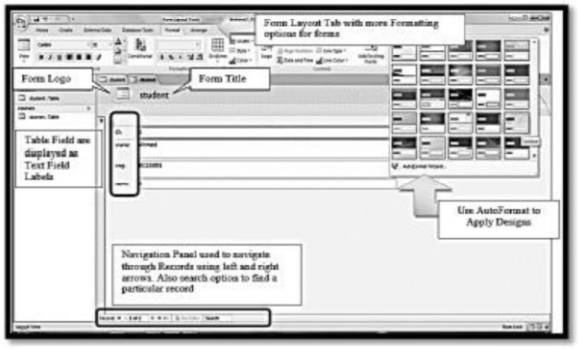


Figure 233: Student Table Form

Database: MS Access (Creating Reports)

Reports are organized and summarized form of your data so you can print or view it onscreen. Reports are often use when you want to analyze your data or present it to others.

Web page Development (Notepad Editor)

In this module, you will learn what is web page, how it can be developed using notepad editor.

What is a Webpage?

A web page is nothing more than a file, a HTML file to be exact. It's called HTML because web page documents have the file extension .html or .htm.

HTML Elements:

An HTML element has a starting and ending tag. Content is placed between start and end tag. Elements can have various attributes.

Web page Development (Introduction to Dreamweaver)

HTML editor is a software application for creating web pages, specialized HTML editors can offer convenience and added functionality. For example, many HTML editors work not only with HTML, but also with related technologies such as CSS (Cascading Style Sheets), XML(Extensible Markup Language) and JavaScript.

Dreamweaver is a powerful application for developing websites and mobile applications. You can save time, work more efficiently, and create compelling designs with the complete set of tools. It is leading software for developing websites and mobile applications.

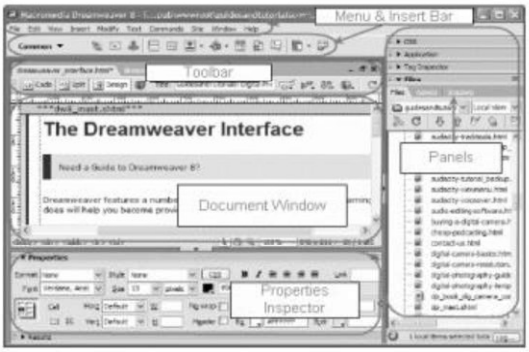


Figure 246: Dreamweaver interface

The Document toolbar: Contains buttons that provide options for different views of the Document window (such as Design view and Code view), various viewing options, and some common operations such as previewing in a browser.

The Menu and Insert bar: Across the top of the application window contains a workspace switcher, menus and other application controls. To display the Standard toolbar, select View

> Toolbars > Standard. The toolbar contains buttons for common operations from the File and Edit menus very similar to MS Word: New, Open, Browse in Bridge, Save, Save All, Print Code, Cut, Copy, Paste, Undo, and Redo.

Web page Development (Inserting Images)

Adding image is very easy using Dreamweaver.

Go to Insert tab and press Image button as shown in the Figure 256.

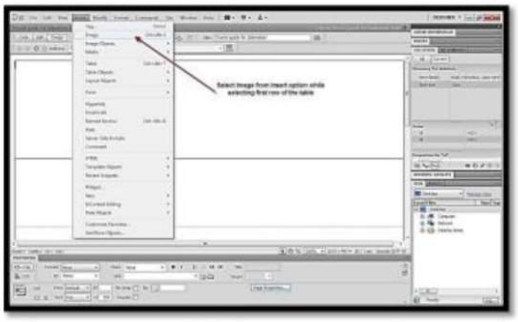


Figure 256: Inserting Image

Then you will be given the option to select the impage from your drive as shown in the Figure 257. You can select the required image and it will be added to your webpage wherever you had placed the cursor.

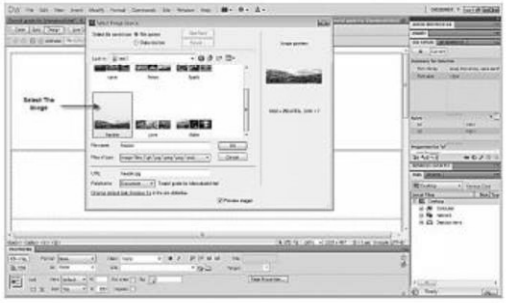


Figure 257: Browse Image

CS101 SHORT NOTES ……PREPARED FROM CS101 OPEN HANDOUTS