

Chapter 1:

The Computer Industry

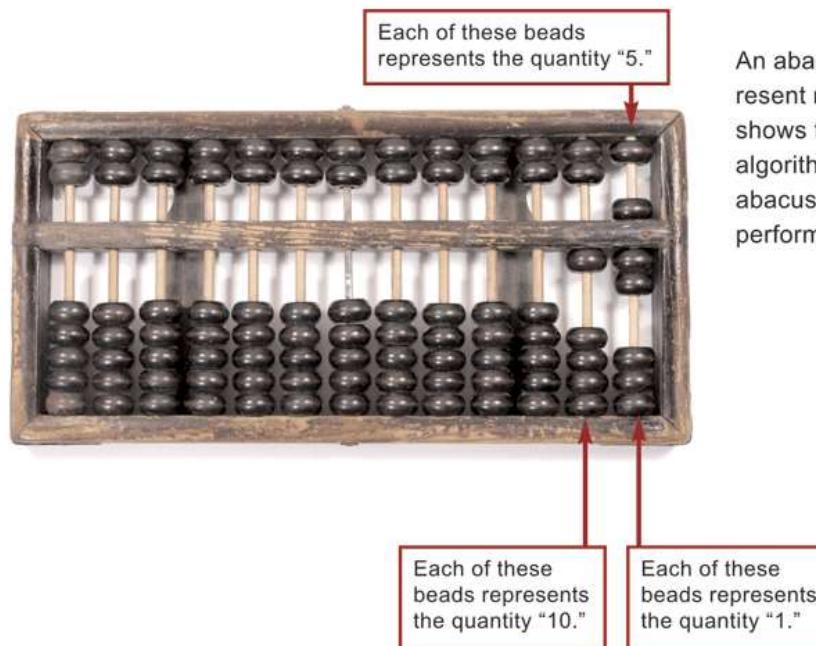
- History
- Overview of Computer Systems
- Careers

Computer History

- ★ Manual Calculators
- ★ Mechanical Calculators
- ★ Computer Prototypes
- ★ Generations of Computers

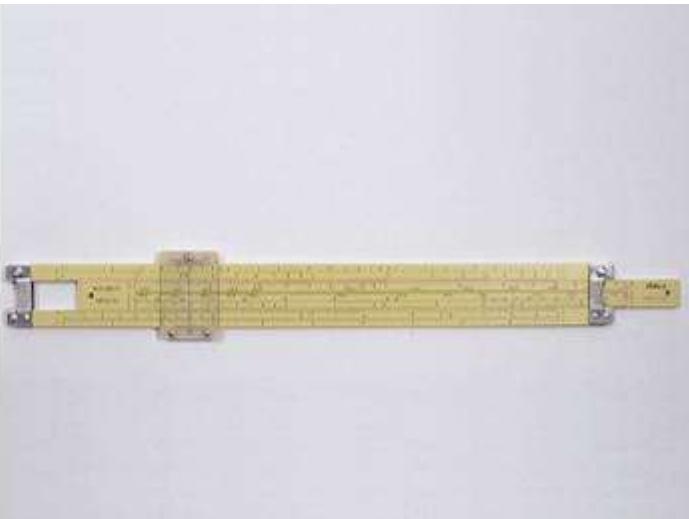
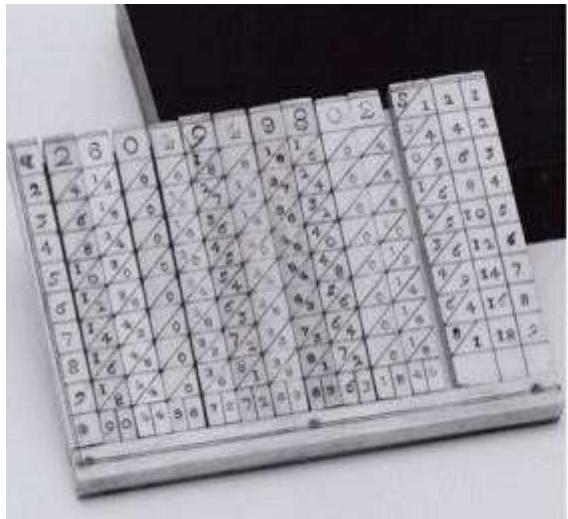
Manual Calculators

- Device that assists in the process of numeric calculations, but requires the human operator to keep track of the algorithm



An abacus uses beads to represent numbers. This abacus shows the number 17. Using an algorithm, the beads on an abacus can be manipulated to perform arithmetic operations.

Manual Calculators



Napier's Bones (left) evolved into the slide rule (right).

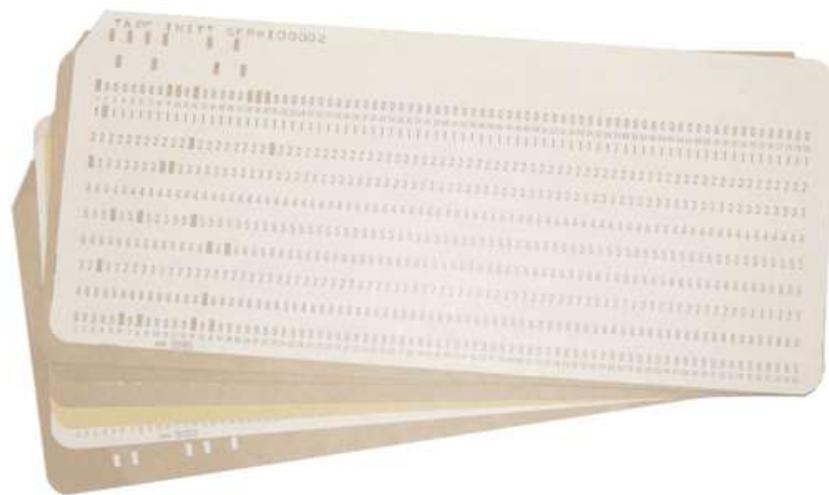
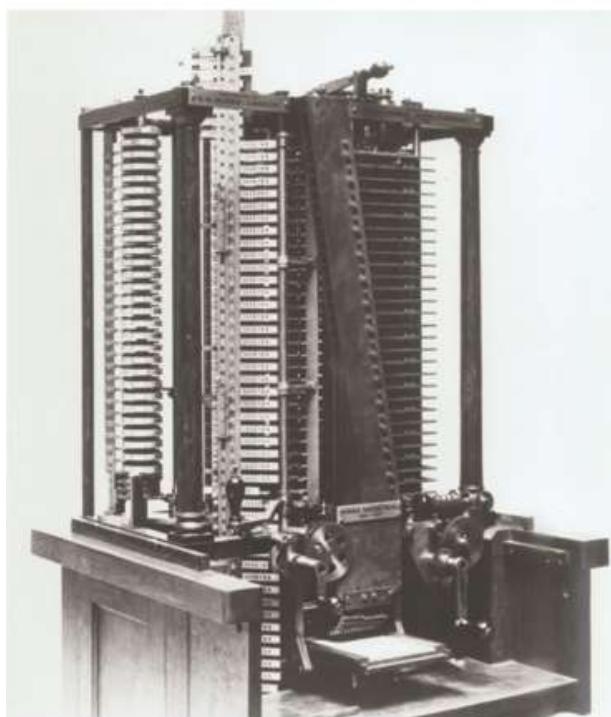
Mechanical Calculators

- ★ Implements algorithms autonomously
 - Schickard's Calculator
 - Pascaline
 - Leibniz Calculator
 - deColmar's Arithmometer
 - Difference Engine
 - Analytical Engine
 - Hollerith Tabulating Machine

Mechanical Calculators

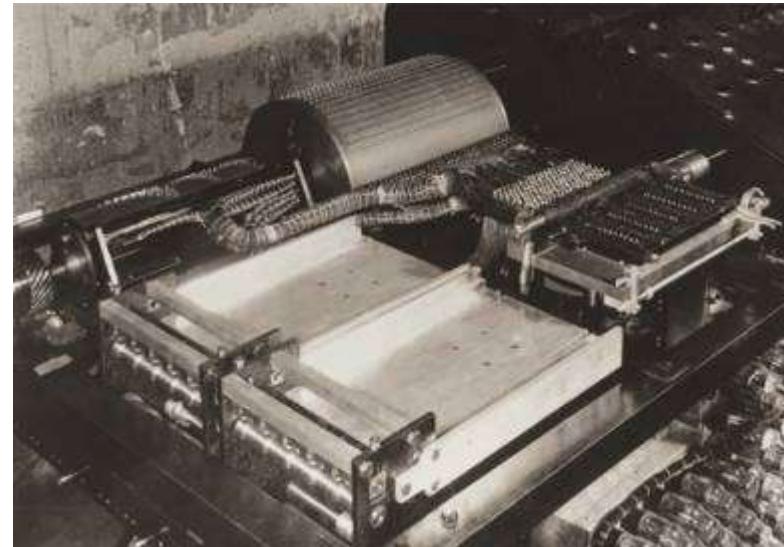
Analytical Engine, generally considered the first computer, designed and partly built by the English inventor [Charles Babbage](#) in the 19th century (he worked on it until his death in 1871).

Charles Babbage conceived of a device called the Analytical Engine, which embodied many of the characteristics that define modern computers. For example, he proposed storing programs and data for calculations on punched cards, much like those used in 1970s mainframes.



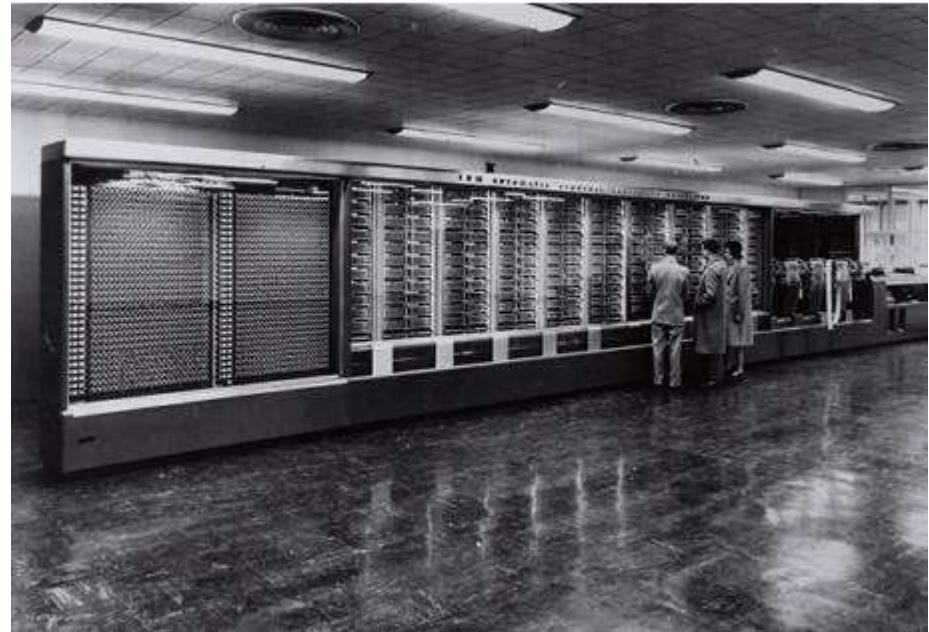
Computer Prototypes

- ★ An experimental device that typically must be further developed and perfected
 - Atanasoff-Berry Computer (ABC)
 - Z3



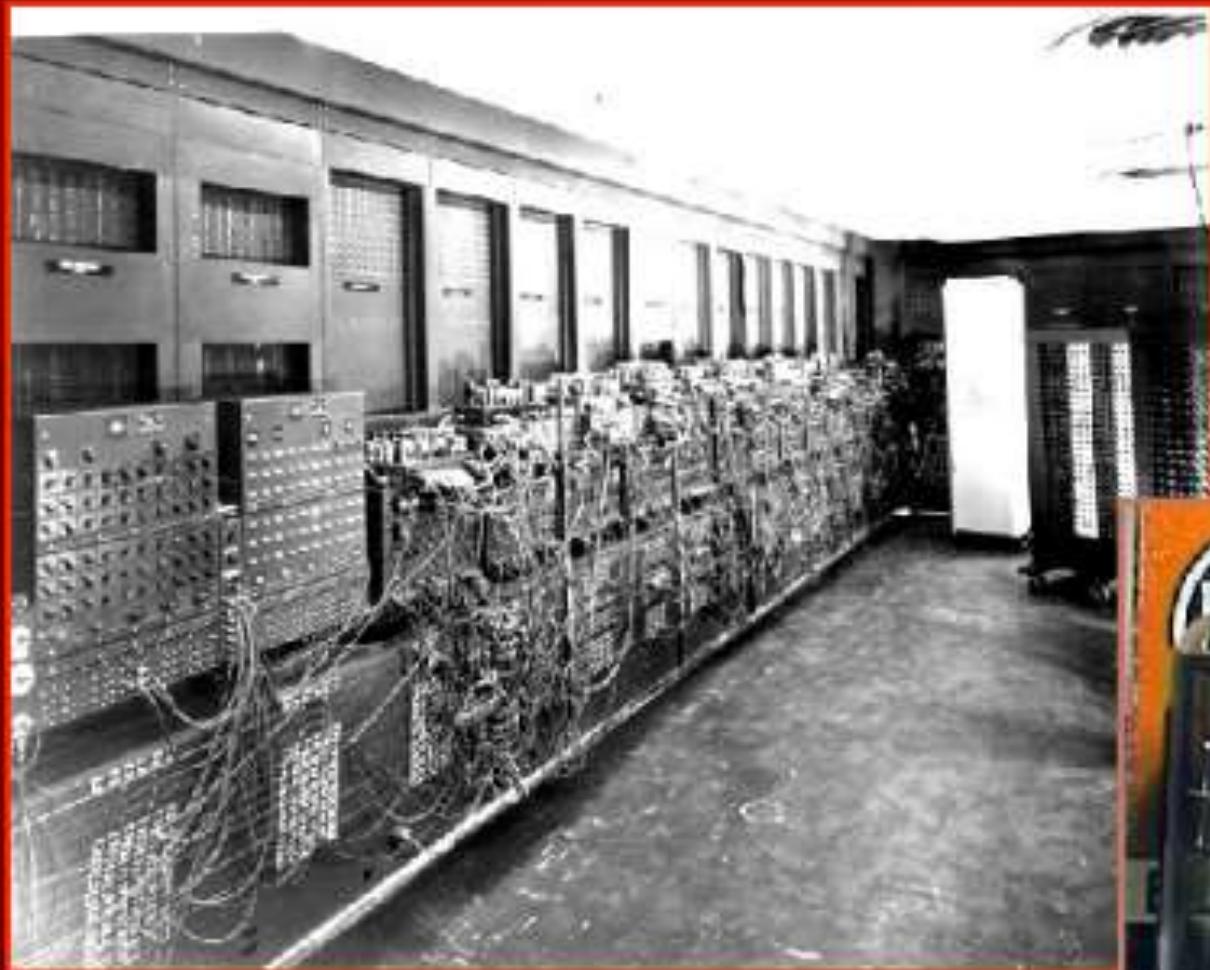
Computer Prototypes

- IBM Automatic Sequence Controlled Calculator (Harvard Mark I)
- COLOSSUS
- ENIAC



ENIAC

Cost: about
\$486,000



Size: over 100 feet long, filling a 30 ft. x 50 ft. room.

Height: 10 feet. Depth: about 3 feet. Weight: about 30 tons.



Generations of Computers

- ★ UNIVAC is considered the first commercially successful digital computer
- ★ First-generation computers
 - Vacuum tubes
- ★ Second-generation computers
 - Transistors



Generations of Computers

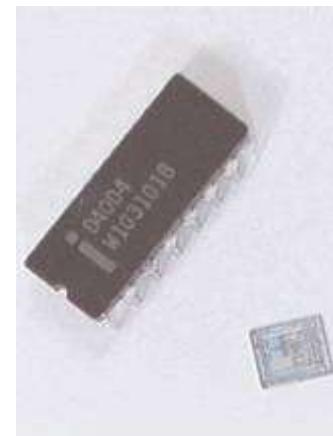
★ Third-generation computers

- Integrated circuits
 - RCA Spectra 70
 - IBM 360
 - DEC PDP-8
 - IBM AS/400



★ Fourth-generation computers

- Microprocessor



Generations of Computers



Fifth Generation – Artificial Intelligence

- Fifth generation computers are in developmental stage which is based on the artificial intelligence.
- The goal of the fifth generation is to develop the device which could respond to natural language input and are capable of learning and self-organization.
- Quantum computation and molecular and nanotechnology will be used in this technology.
- we can say that the fifth generation computers will have the power of human intelligence.

Questions



Overview of Computer Systems

- ★ Computer Define
- ★ Components of a Computer System
- ★ Categories of Computers



Computer Define

What Is a Computer ?

- How is a **computer** defined?
 - Electronic device operating under the control of instructions stored in its own memory

Accepts **data**

Raw facts, figures, and symbols

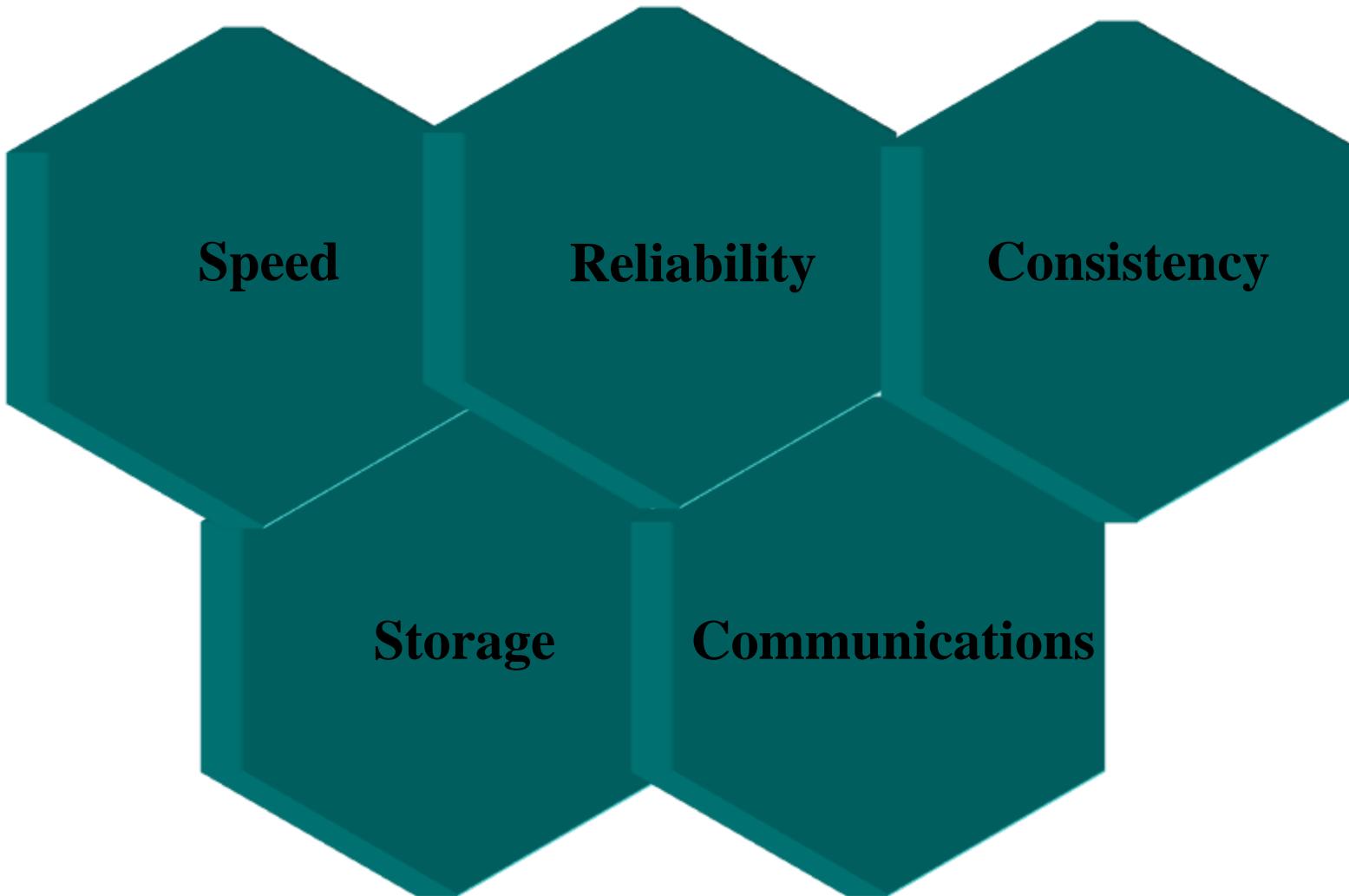
Processes data into
information

Data that is organized,
meaningful, and useful

Produces and stores results

Advantages and Disadvantages of Using Computers

- What are the advantages of using computers?



Advantages and Disadvantages of Using Computers

- What are the disadvantages of using computers?

**Violation of
Privacy**

**Impact on
Labor Force**

Health Risks

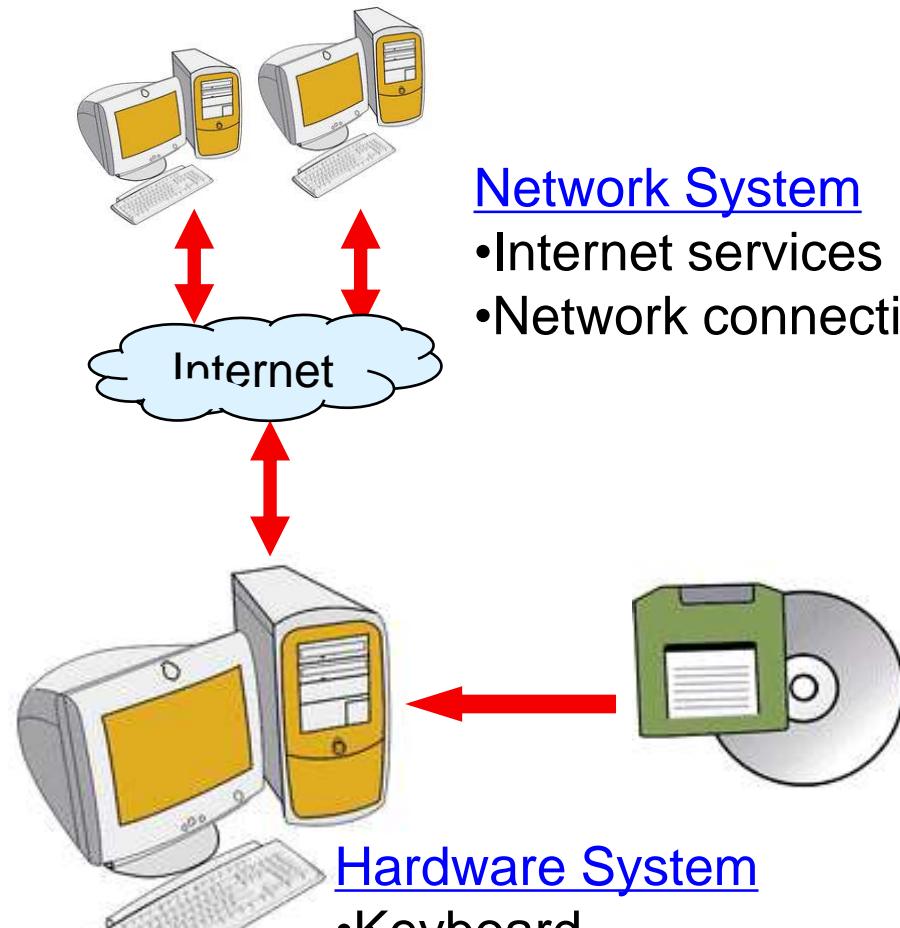
**Impact on
Environment**





Components of a Computer System

Components of a Computer System



Network System

- Internet services (email)
- Network connections (modems, network cards)

Software System

- Operating System (Unix, Mac OS, Microsoft Windows)
- Web browser (Netscape, Internet Explorer)
- Office productivity applications (Microsoft Office, Star Office)

Hardware System

- Keyboard
- Monitor
- System unit

1. Hardware System

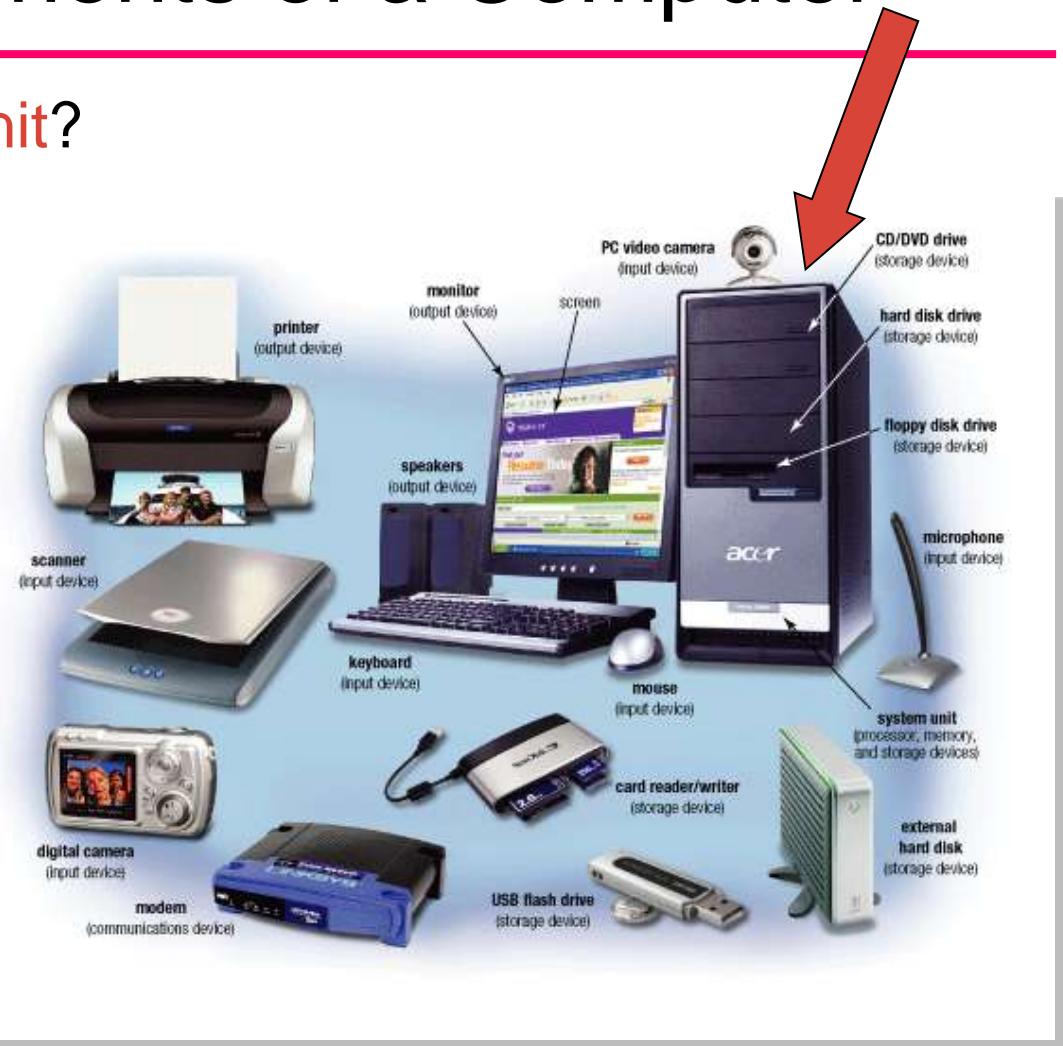
The *Outside* of A Computer



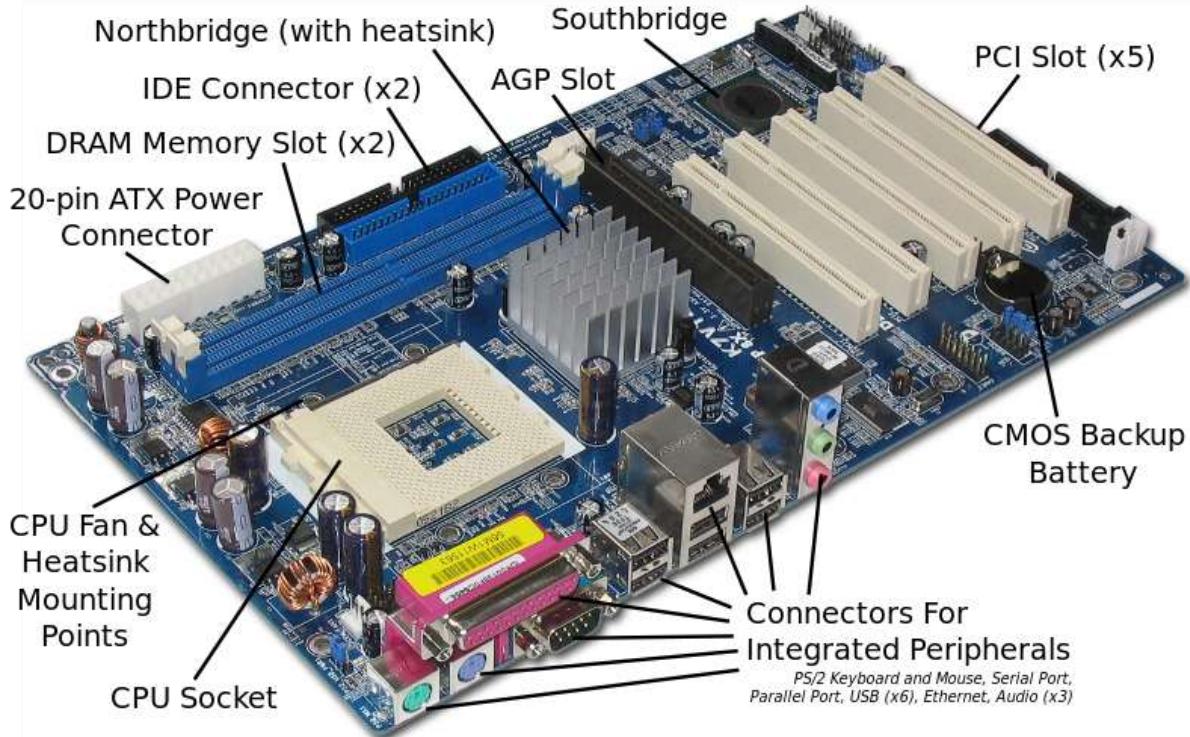
The Components of a Computer

- What is the **system unit**?

➤ **Box-like case containing electronic components used to process data**



Components inside the system unit



The Components of a Computer

- What are two main components on the motherboard?

Central Processing Unit (CPU)

Also called a **processor**

The electronic component that interprets and carries out the basic instructions that operate the computer

Memory

Consists of electronic components that store instructions waiting to be executed and data needed by those instructions

Peripheral Devices

- Equipment added to computer to enhance its functionality
- Modify and expand the basic computer system
- Examples of peripheral devices:
 - Keyboard
 - Monitor
 - Mouse
 - Printer
 - Scanner
 - Digital Video Camera
 - Graphic Tablet
 - Joy Stick

The Components of a Computer

- What is an **input device** ?

➤ **Hardware used
to enter data
and instructions**



The Components of a Computer

- What is an **output device** ?

➤ **Hardware that conveys information to one or more people**



Storage Devices

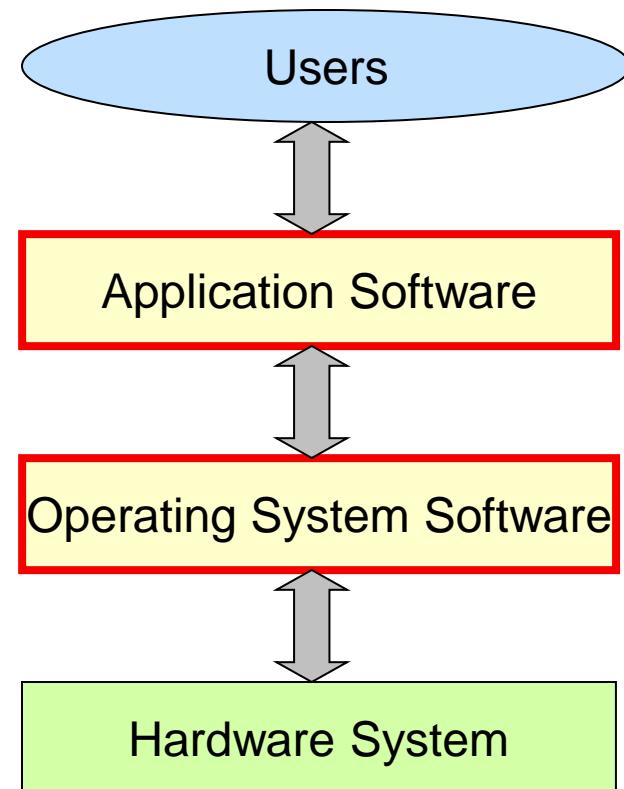
- Optical Discs
 - CD-ROM
 - CD-RW
 - DVD-ROM
- Magnetic Discs
 - Floppy disk
 - Hard disk (removable & fixed)
- Electronics Discs
 - Flash Memory
 - Solid State Discs (SSD)
 - **SSD Technology: NVMe, SATA, M.2**

2. What is Software?

- Software is a set of computer instructions or data.
- Software receives input from the user and processes this input through the computer to produce output.
- Software directs how the computer interacts with the user.
- Software specifies how to process the user's data

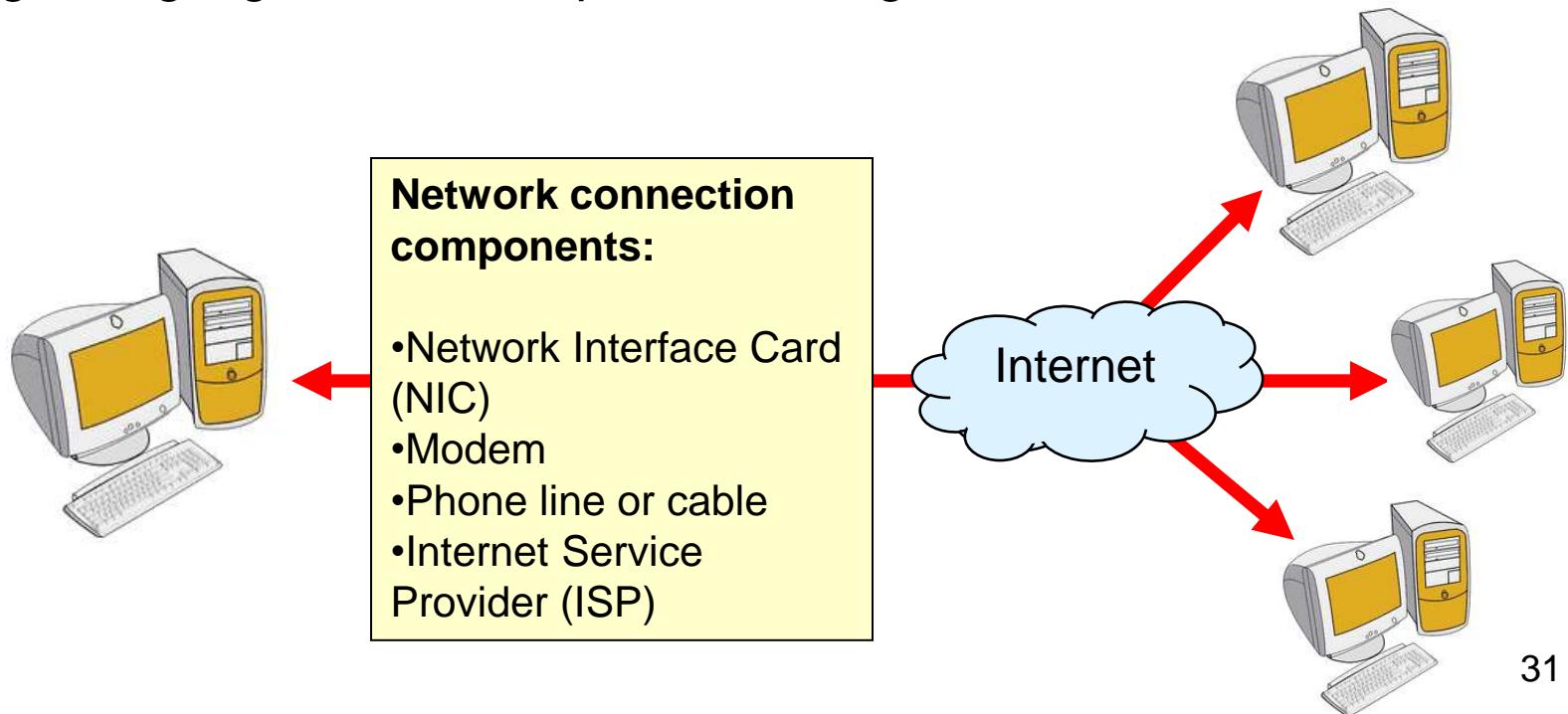
Software System

- Two categories: operating system (OS) software and application software.
- **Operating system** software, also called system software, is the master controller for all activities that take place within a computer
 - Examples of OS software:
 - Microsoft Windows
 - Unix, Linux
 - Mac OS
 - iSeries
- **Application software** is a set of one or more computer programs that helps a person carry out a task
 - Examples of application software:
 - Microsoft Word
 - Internet Explorer
 - Photoshop



3. Network System

- A network provides connections among computers to enable computers on a network to share data (e.g. documents), hardware (e.g. printers), and software resources (e.g. application programs).
- Network users can also send messages to each other.
- A network must be secured to protect data from unauthorized usage (e.g. using login name and password to gain access to a network).



Basic Computer Model

- All computers perform four basic operations
 - Input Data
 - Process Data
 - Store Data
 - Output Data

Basic Operations

- **Input data** is to feed information which can be supplied by any person, environment or other computer.
- **Processing data** is manipulating data by performing calculations, sorting lists of words or numbers, drawing pictures.
- **Storing data** is for future retrieval and processing. Memory holds data that is waiting to be processed, and storage areas hold data permanently until the data is deleted.
- **Output data** is the result produced by a computer, which includes reports, documents, music, graphs, pictures and movies.



Categories of Computers

Categories of Computers

- Computers are classified based on their technology, function, physical size, performance and cost.
- The categories of computers include:
 - Personal computers
 - Handheld computers
 - Mainframes
 - Supercomputers
 - Embedded Computers

Personal Computer (PC)

- Designed to meet the computing needs of an individual



Desktop computers

Notebook computers



Personal Computers

- What is a **desktop computer** ?
 - Designed so all of the components fit on or under a desk or table



Mobile Computers and Mobile Devices

- What is a **notebook computer** ?
 - Portable, small enough to fit on your lap
 - Also called a **laptop computer**
 - Generally more expensive than a desktop computer
- What is a **netbook computer** ?

Netbooks are a category of small, lightweight, legacy-free, and inexpensive laptop computers.



Mobile Computers and Mobile Devices

- What is a **Tablet PC** ?
 - Resembles a letter-sized slate
 - Allows you to write on the screen using a digital pen
- **Especially useful for taking notes and Internet access**

A tablet computer, or a tablet, is a mobile computer, larger than a mobile phone or personal digital assistant, integrated into a flat touch screen and primarily operated by touching the screen rather than using a physical keyboard.



Mobile Computers and Mobile Devices

- What is a **handheld computer?**

**Small
enough to fit
in one
hand**



**Used
by mobile
employees such as
meter readers and
delivery people**



Mobile Computers and Mobile Devices

- What is a **personal digital assistant (PDA)**?

- Provides personal organizer functions
 - Calendar
 - Appointment book
 - Address book
 - Calculator
 - Notepad



Mobile Computers and Mobile Devices

- What are **smart phones?**

A smart phone is
an Internet-enabled
telephone that usually
provides PDA capabilities



Servers

- What types of servers are there?

A **server** controls access to network resources and provides centralized storage

Mainframe Very powerful, expensive computer that supports thousands of computers

Supercomputer The fastest, most powerful, most expensive computer. Used for applications requiring complex mathematical calculations



Mainframe Computer

- It is a large and expensive computer that is capable of handling requests and passing data simultaneously to many users.
- Used by governments and large corporations to provide centralized storage and control
- Processes billions of data per second
- Handles communication between users
- Searches for requests given by user.



主机室

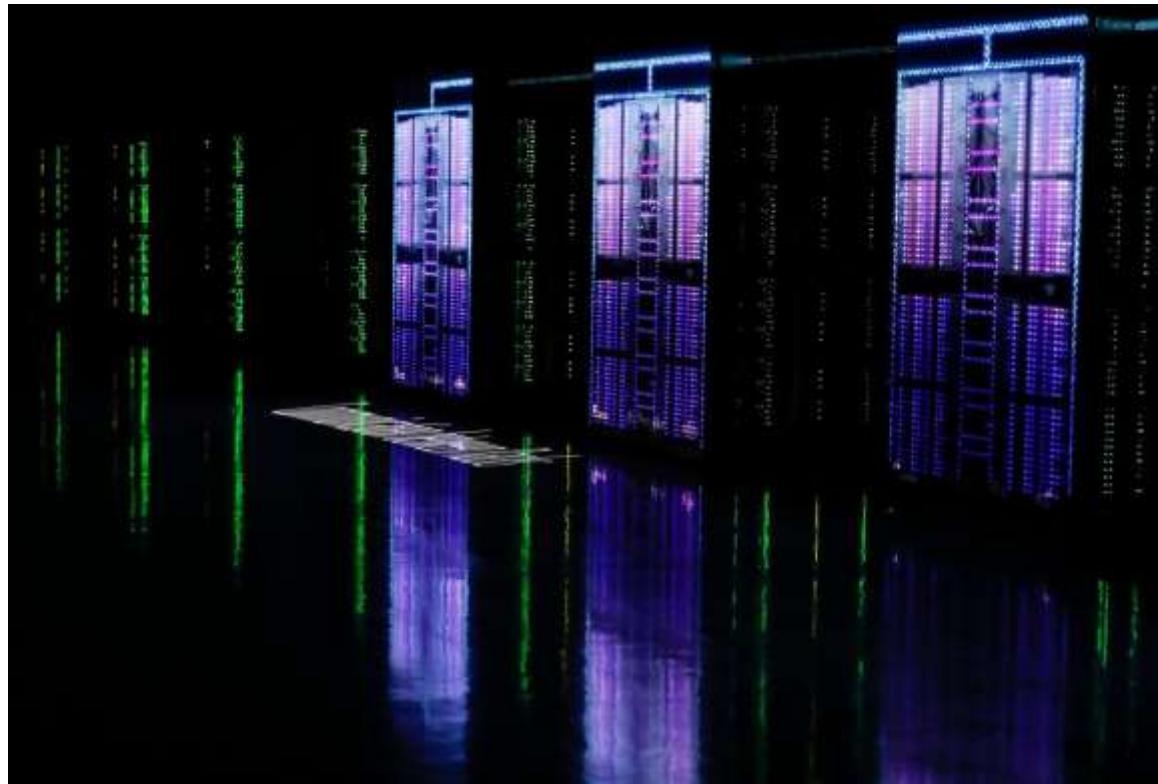
University of Electronic Science and Technology
IBM z-Series Z900 Mainframe

Supercomputer

- It is the fastest type of computer.
- Supercomputers are very expensive and are employed for specialized applications that require immense amounts of mathematical calculations.
- The largest, most powerful supercomputers are really multiple computers that perform parallel processing.
- Two parallel processing approaches: symmetric multiprocessing (SMP) and massively parallel processing (MPP).
- It is often used for:
 - Breaking codes
 - Modeling weather systems
 - Simulating nuclear explosions
- Examples: Deep Blue, PARAM 1000

Japanese Supercomputer Is Crowned World's Speediest

In the race for the most powerful computers, Fugaku, a Japanese supercomputer, recently beat American and Chinese machines.



Fugaku, Japan's new supercomputer, at the Riken Center for Computational Science in Kobe. The machine carried out 2.8 times more calculations a second than an IBM system in Tennessee. © 2020 The New York Times Company

Embedded Computers

- What is an **embedded computer**?
 - A special-purpose computer that functions as a component in a larger product



Questions



Careers for Computer Professionals

- ★ Jobs and Salaries
- ★ Education and Certification
- ★ Job Hunting Basics
- ★ Resumes and Web Portfolios
- ★ Job Listings

Jobs and Salaries

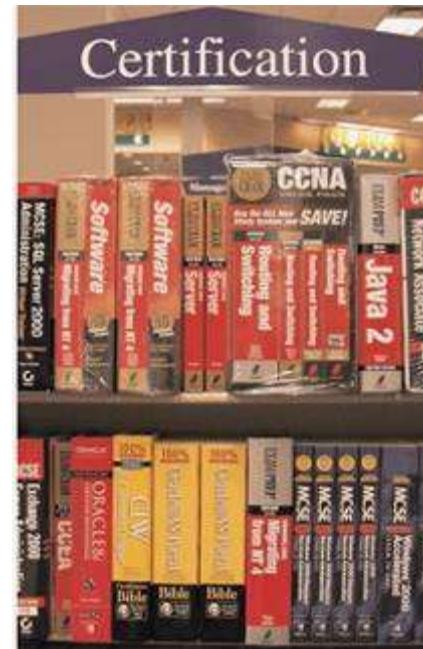
- Information Systems department
 - Chief Information Officer
 - Systems Analyst
 - Computer Programmer
 - Security Specialist
 - Database Administrator
 - Network Specialist/Administrator
 - Computer Operator
 - Technical Support Specialist
 - Web site designer

Education and Certification

- Computer engineering
- Computer science
- Information systems
- Information technology
- Software engineering
- The Peterson's Web site is a comprehensive resource for educational services
 - www.petersons.com

Education and Certification

- Certificates of completion are available to students who successfully complete one or more courses on a specified topic
- A certification exam is an objective test that verifies your level of knowledge
 - General computer knowledge
 - Software applications
 - Database administration
 - Networking
 - Computer hardware
 - Computer security



Job Hunting Basics

- Job hunting steps
- The Internet is a great resource for finding a job

John Smith
IT Project Manager

IT Professional with over 10 years of experience specializing in IT department management for international logistics companies. I can implement effective IT strategies at local and global levels. My greatest strength is business awareness, which enables me to proactively structure infrastructure and applications. Striving to leverage my skills at SeaCorp Inc.

Experience

2000-12 - present
Senior Project Manager
Seas Hospital, ME
+ Overview of major hospital IT projects for 12+ years, focus on cost reduction.
+ Responsible for creating, improving, and developing IT project strategies.
+ Implemented the highly successful Linux Training and Lab (Linux) projects.
+ Cut costs by 20% in less than six months.
+ Reduced the cost of IT maintenance in 2003 by successfully reducing the server infrastructure resulting in over \$50,000 of annual savings.

2004-09 -
Junior Project Manager
Seas Hospital, ME
+ Standardized IT logistics and administration operations cutting costs by 25%.
+ Diagnosed problems with hardware and operating systems.
+ Successfully request two servers to new data architecture.
+ Maintained the user database of over 30000 patients.
+ Managed project for Linux training for all IT Support officers.

2002-08 -
IT Support Officer
Seas Hospital, ME
+ Provided support for project managers and hospital staff for 2 years.
+ Prepared over 100 infrastructure performance analysis and reports.
+ Implemented a new tracking method, cutting initial data input by 40%.
+ Successfully resolved over 200 issues in regards to IT infrastructure.

Education

1996-00 -
Bachelor of Computer Science, University of Maryland
+ Graduated Summa Cum Laude.
+ Attended Postgraduate Program to study advanced nursing techniques.
+ Managed a student project to develop a weekly nursing podcast.

1999-04 -
Bachelor of Computer Science, University of Maryland
+ Developed Summa Cum Laude.
+ Member of Student Association of Computer Science.
+ Managed a student project to organize a conference for 30+ professionals.

Certifications

2010-15 PMP - Project Management Institute

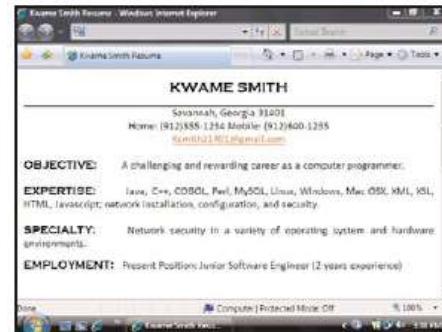
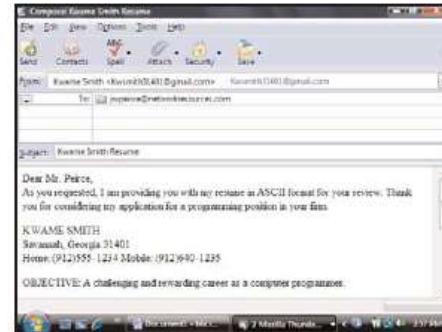
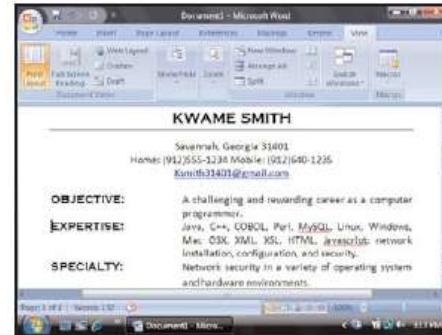
2007-11 CAPM - Project Management Institute

2003-04 PRINCE2 Foundation



Resumes and Web Portfolios

- You can prepare your resume in formats suitable for different computer platforms and delivery methods
 - Print
 - E-mail
 - HTML and XML



Resumes and Web Portfolios

- A Web portfolio is a hypertext version of your resume, which might contain links to relevant Web sites
 - Supply multimedia presentations only when requested
 - You can post your Web portfolio on your personal Web site
 - <https://bepatrickdavid.com>
-



Patrick David

CEO & UI/UX Designer, FrontEnd Developer

Patrick David Creative Agency

bepatrickdavid.com

📍 Belluno, Italy

Job Listings

- Sources of job listings
 - Newspaper's Help Wanted section
 - School's career placement office
 - Local state employment agency
 - Online job bank
 - Job search agent
 - Metasearch tool

The screenshot shows the homepage of Kariyer.net, a Turkish job search platform. At the top, there is a navigation bar with links for 'ÜYE OL' (Sign Up), 'ÜYE GİRİŞİ' (Sign In), 'İŞVEREN' (Employer), and 'İLAN YAYINLA' (Post Job). Below the navigation, a purple banner displays the message 'Senin için burada 77.259 ilan var!' (There are 77,259 jobs for you here!). The main search area features a dropdown for 'Şehir' (City), a search input for 'Pozisyon, firma adı, sektör' (Position, company name, sector), a large 'İŞ BUL' (Find Job) button, and a 'DETAYLI ARA' (Advanced Search) link. Below this, a section titled 'ÖNE ÇIKAN İŞ İLANLARI' (Top Job Listings) shows logos and names of companies: Apple, LANDMARK INTERNA..., Siemens, Tümpa, Pure Life, and GLAMIRA. At the bottom, three cards highlight specific job categories: 'UZMAN' (21,467 job ads), 'YÖNETİCİ' (4,063 job ads), and 'YENİ MEZUN' (2,023 job ads).

Job Listings

İş Ara İşverenler / İş İlanı Ver

CVnizi yükleyin Giriş

ne
pozisyon adı, anahtar kelimeler veya şirket adı giriniz.

nerede
iş aramak istediğiniz il veya İlçe adını giriniz

Kocaeli

Ara

[CVnizi hazırlayın](#) - Binlerce işe her yerden kolaylıkla başvurun

[İşverenler: Bir iş ilanı verin](#) - Bir sonraki çalışmanız burada

son 7 günde 14.487 yeni [iş ilanı](#)
İş siteleri, gazeteler, dernekler ve şirket kariyer sayfalarını arayın.

Amerika Birleşik Devletleri'ndeki İşler için, buraya ziyaret edin: www.indeed.com

An online search agent autonomously searches for jobs that match your requirements.

Careers in Computing

- A **systems analyst** investigates the requirements of a business or organization, its employees, and its customers in order to plan and implement new or improved computer services
- A **security specialist** analyzes a computer system's vulnerability to threats from viruses, worms, unauthorized access, and physical damage
- A **computer programmer** designs, codes, and tests computer programs
- A **quality assurance specialist** participates in alpha and beta test cycles of software
- A **database administrator** analyzes a company's data to determine the most effective way to collect and store it

Careers in Computing (cont.)

- A **network specialist/administrator** plans, installs, and maintains one or more local area networks
- A **computer operator** typically works with minicomputers, mainframes, and supercomputers
- A **computer engineer** designs and tests new hardware products, such as computer chips, circuit boards, computers, and peripheral devices
- A **technical support specialist** provides phone or online help to customers of computer companies and software publishers

Careers in Computing (cont.)

- A **technical writer** creates documentation for large programming projects, and writes the online or printed user manuals that accompany computers, peripheral devices, and software
- A **computer salesperson**, or “sales rep,” sells computers
- A **Web site designer** creates, tests, posts, and modifies Web pages
- A **manufacturing technician** participates in the fabrication of computer chips, circuit boards, system units, or peripheral devices

Examples of Computer Usage

➤ What are five categories of computer users?

- Home User
- Small Office/Home Office User
- Mobile User
- Power User
- Large Business User



End of Chapter -1

Chapter 2:

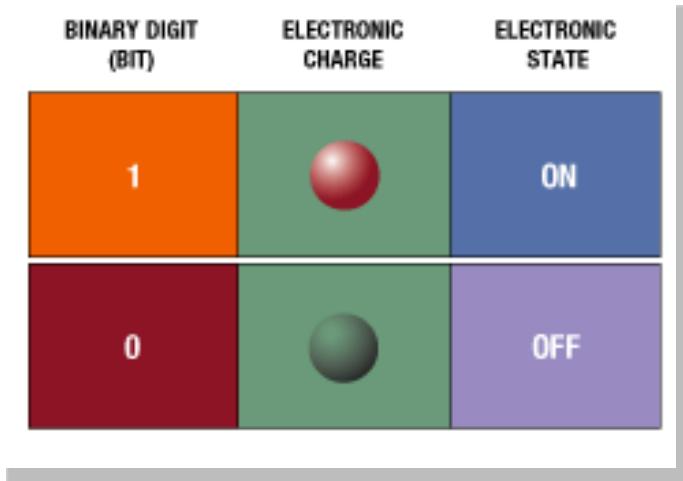
The Computer Industry

- Data Representation in a Computer System
- Overview of Hardware Components
- Computer Memory and Function

Data Representation

Data Representation

- How do computers represent data?
 - Most computers are **digital**



- Recognize only two discrete states: on or off
- Use a **binary system** to recognize two states
- Use Number system with two unique digits: 0 and 1, called **bits** (short for binary digits)

Data Representation

- What is a **byte** ?
 - Eight bits grouped together as a unit
 - Provides enough different combinations of 0s and 1s to represent 256 individual characters
 - Numbers
 - Uppercase and lowercase letters
 - Punctuation marks
-
- The image displays three separate diagrams, each representing an 8-bit byte. Each byte is shown as an 8x2 grid of circles, where each row represents a bit position from 0 to 7. Red circles represent binary value 1, and black circles represent binary value 0.
- 8-BIT BYTE FOR THE NUMBER 4:** The grid shows the sequence: 0, 0, 1, 1, 0, 1, 0, 0.
 - 8-BIT BYTE FOR THE NUMBER 6:** The grid shows the sequence: 0, 0, 1, 1, 0, 1, 1, 0.
 - 8-BIT BYTE FOR THE LETTER E:** The grid shows the sequence: 0, 1, 0, 0, 0, 1, 0, 1.

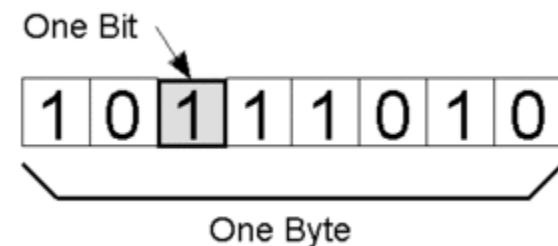
ASCII TABLE

Decimal	Hex	Char	Decimal	Hex	Char	Decimal	Hex	Char	Decimal	Hex	Char
0	0	[NULL]	32	20	[SPACE]	64	40	@	96	60	`
1	1	[START OF HEADING]	33	21	!	65	41	A	97	61	a
2	2	[START OF TEXT]	34	22	"	66	42	B	98	62	b
3	3	[END OF TEXT]	35	23	#	67	43	C	99	63	c
4	4	[END OF TRANSMISSION]	36	24	\$	68	44	D	100	64	d
5	5	[ENQUIRY]	37	25	%	69	45	E	101	65	e
6	6	[ACKNOWLEDGE]	38	26	&	70	46	F	102	66	f
7	7	[BELL]	39	27	'	71	47	G	103	67	g
8	8	[BACKSPACE]	40	28	{	72	48	H	104	68	h
9	9	[HORIZONTAL TAB]	41	29	}	73	49	I	105	69	i
10	A	[LINE FEED]	42	2A	*	74	4A	J	106	6A	j
11	B	[VERTICAL TAB]	43	2B	+	75	4B	K	107	6B	k
12	C	[FORM FEED]	44	2C	,	76	4C	L	108	6C	l
13	D	[CARRIAGE RETURN]	45	2D	-	77	4D	M	109	6D	m
14	E	[SHIFT OUT]	46	2E	.	78	4E	N	110	6E	n
15	F	[SHIFT IN]	47	2F	/	79	4F	O	111	6F	o
16	10	[DATA LINK ESCAPE]	48	30	0	80	50	P	112	70	p
17	11	[DEVICE CONTROL 1]	49	31	1	81	51	Q	113	71	q
18	12	[DEVICE CONTROL 2]	50	32	2	82	52	R	114	72	r
19	13	[DEVICE CONTROL 3]	51	33	3	83	53	S	115	73	s
20	14	[DEVICE CONTROL 4]	52	34	4	84	54	T	116	74	t
21	15	[NEGATIVE ACKNOWLEDGE]	53	35	5	85	55	U	117	75	u
22	16	[SYNCHRONOUS IDLE]	54	36	6	86	56	V	118	76	v
23	17	[END OF TRANS. BLOCK]	55	37	7	87	57	W	119	77	w
24	18	[CANCEL]	56	38	8	88	58	X	120	78	x
25	19	[END OF MEDIUM]	57	39	9	89	59	Y	121	79	y
26	1A	[SUBSTITUTE]	58	3A	:	90	5A	Z	122	7A	z
27	1B	[ESCAPE]	59	3B	;	91	5B	[123	7B	{
28	1C	[FILE SEPARATOR]	60	3C	<	92	5C	\	124	7C	
29	1D	[GROUP SEPARATOR]	61	3D	=	93	5D]	125	7D	}
30	1E	[RECORD SEPARATOR]	62	3E	>	94	5E	^	126	7E	~
31	1F	[UNIT SEPARATOR]	63	3F	?	95	5F	-	127	7F	[DEL]

- x Computers can only understand numbers, so an ASCII code is the numerical representation of a character

Data Representation: Bits and Bytes

- Recall computers are made up of electrical components
- Data can be represented electronically with electrical components being on or off.
- On and off states can be represented using digits 0s and 1s. For example:
 - 0: Off state
 - 1: On state
- Data can be represented digitally using digits 0 and 1.
 - 0 and 1 are called binary digits.
 - Each binary digit is called a bit.
 - Eight Bits equal to one byte.



Number Systems

- Decimal : base 10 (digits 0-9)
 - Decimal number system has ten symbols: 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9, called *digits*.
- Binary : base 2 (digits 0-1)
 - Binary number system has two symbols: 0 and 1, called *bits*.
- Octal : base 8 (digits 0-7)
 - Octal numbers have a range of just “8” digits, (0, 1, 2, 3, 4, 5, 6, 7).
- Hexadecimal : base16 (digits 0-9 and A-F)
 - Hexadecimal number system uses 16 symbols: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, and F, called *hex digits*.

Comparison of Values in Different Bases

Decimal Value	Binary Value	Octal Value	Hexadecimal Value
0	000000	00	00
1	000001	01	01
2	000010	02	02
3	000011	03	03
4	000100	04	04
5	000101	05	05
6	000110	06	06
7	000111	07	07
8	001000	10	08
9	001001	11	09
10	001010	12	0A
11	001011	13	0B
12	001100	14	0C
13	001101	15	0D
14	001110	16	0E
15	001111	17	0F

Conversion Between Number Systems

Binary → Decimal

Decimal → Binary

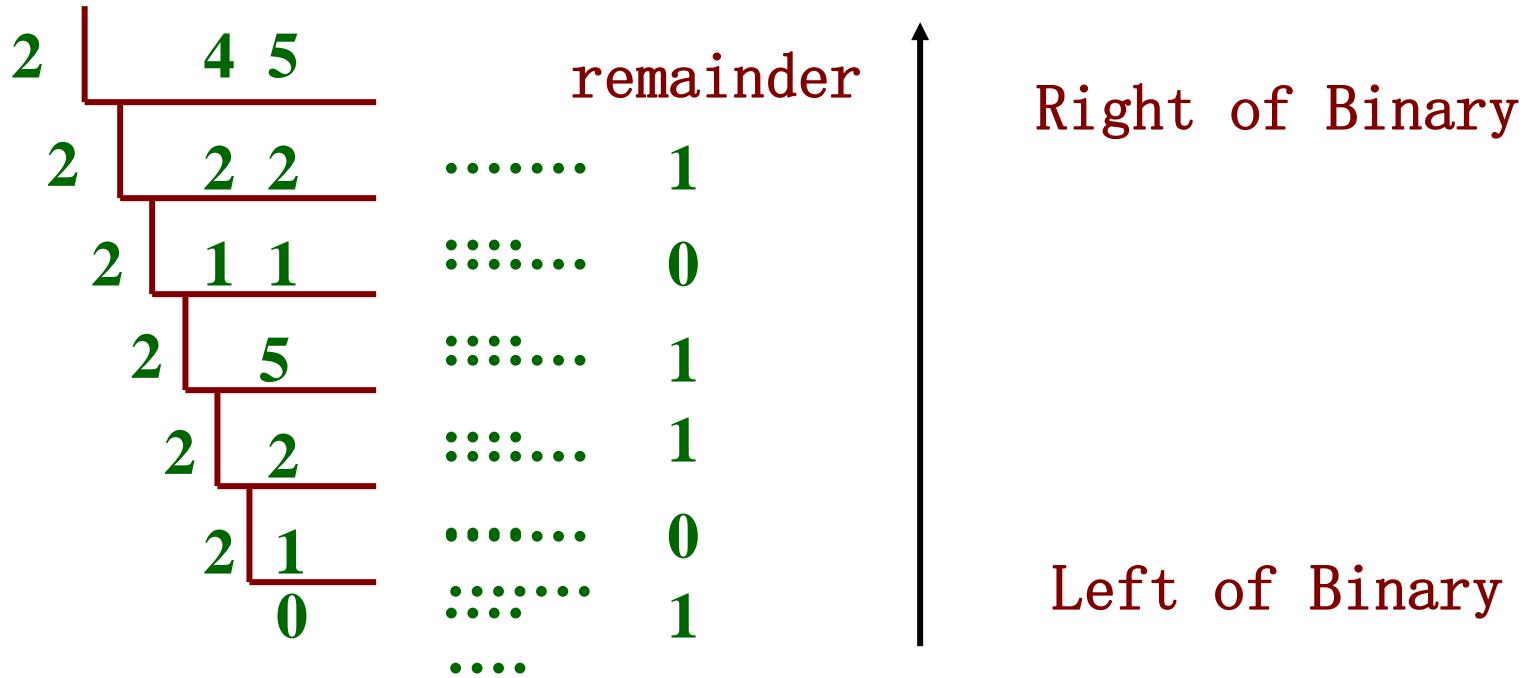
Octal , Hexadecimal → Binary

Binary → Octal , Hexadecimal

Integer → Binary

Method:

Eg: Integer 45 → Binary



Result: $(45)_{10} = (101101)_2$

Exercise: Convert Decimal to Binary

Example #1

Convert 13_{10} to binary:

$$13_{10} = 1101_2$$

Division by 2	Quotient	Remainder	Bit #
13/2	6	1	0
6/2	3	0	1
3/2	1	1	2
1/2	0	1	3

Example #2

Convert 174_{10} to binary:

$$174_{10} = 10101110_2$$

Division by 2	Quotient	Remainder	Bit #
174/2	87	0	0
87/2	43	1	1
43/2	21	1	2
21/2	10	1	3
10/2	5	0	4
5/2	2	1	5
2/2	1	0	6
1/2	0	1	7

Decimal Fraction → Binary

Method:

dot.

Example:
convert decimal
0.8125 to binary

last

Separate integer

$$\begin{array}{r} 0.8125 \\ \times 2 \\ \hline 1.6250 \\ \end{array}$$
$$\begin{array}{r} 0.625 \\ \times 2 \\ \hline 1.250 \\ \end{array}$$
$$\begin{array}{r} 0.25 \\ \times 2 \\ \hline 0.50 \\ \end{array}$$
$$\begin{array}{r} 0.5 \\ \times 2 \\ \hline 1.0 \\ \end{array}$$

Result:

$$(0.8125)_{10} = (.1101)_2$$



Convert $(0.1)_{10}$
to binary

Step 1: $0.1 \times 2 = 0.2$, the first binary digit to the right of the point is a **0**.

So far, we have $.1$ (decimal) = $.0???$. . . (base 2).

Step 2: $0.2 \times 2 = 0.4$, the second binary digit to the right of the point is also a **0**.

So far, we have $.1$ (decimal) = $.00???$. . . (base 2).

Step 3: $0.4 \times 2 = 0.8$, the third binary digit to the right of the point is also a **0**.

So now we have $.1$ (decimal) = $.000???$. . . (base 2).

Step 4: $0.8 \times 2 = 1.6$, the fourth binary digit to the right of the point is a **1**.

So now we have $.1$ (decimal) = $.0001???$. . . (base 2).

Step 5: $0.6 \times 2 = 1.2$, the fifth binary digit to the right of the point is a **1**.

So now we have $.1$ (decimal) = $.00011???$. . . (base 2).

Step 6: We are then bound to repeat steps 2-5, then return to Step 2 again indefinitely. In other words, we will never get a 0 as the decimal fraction part of our result. Instead we will just cycle through steps 2-5 forever. This means we will obtain the sequence of digits generated in steps 2-5, namely 0011, over and over. Hence, the final binary representation will be.

0.1 (decimal) = $.00011001100110011$. . . (base 2).

The repeating pattern is more obvious if we highlight it in color as below:

0.1 (decimal) = $.0\textcolor{red}{0011}\textcolor{green}{0011}\textcolor{red}{0011}\textcolor{green}{0011}$. . . (base 2).

Octal , Hexadecimal → Binary

- How to express and switch them?
 - Each hexadecimal or Octal digit represents four binary places.
 - Hexadecimal or Octal digit can be used as shorthand for binary notation
 - One Hex digit  four bits
 - One byte = 8 bits  two Hex digits

Binary Digit Value	001101010111001111
Group the bits into three's starting from the right hand side	001 101 010 111 001 111
Octal Number form	1 5 2 7 1 7 ₈

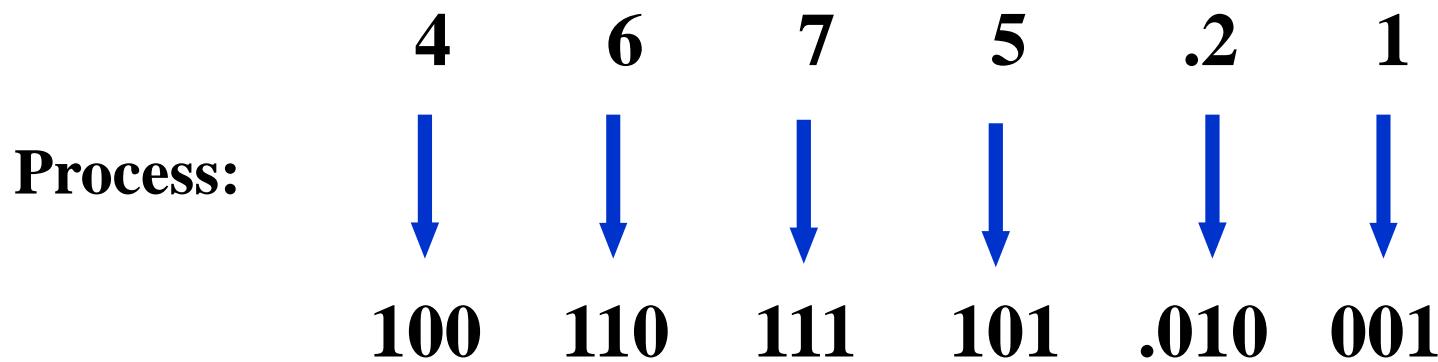
11101010 ₂			
Group the bits into four's starting from the right hand side			
=	1110	1010	

Find the Decimal equivalent of each individual group			
=	14	10	(in decimal)
Convert to Hexadecimal using the table above			
=	E	A	(in Hex)

Octal → Binary

$$2^3 = 8$$

example: octal $(4675.21)_8 \rightarrow$ binary

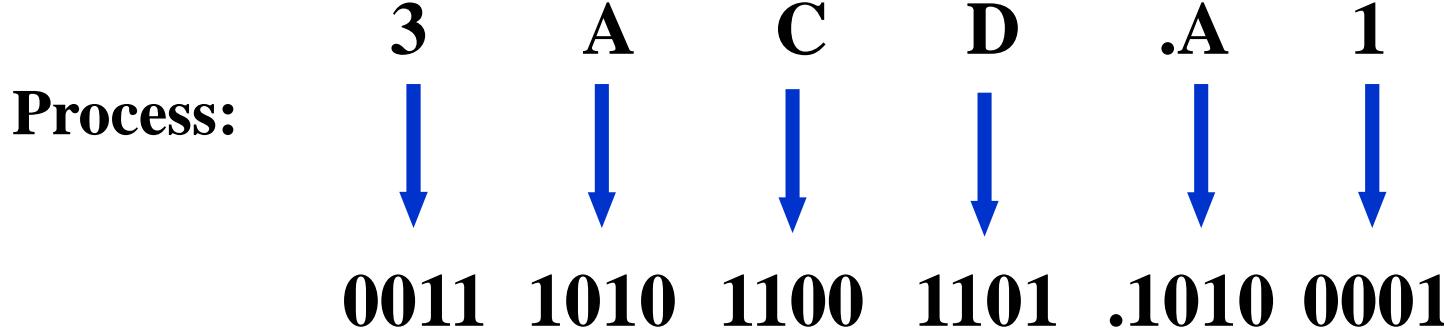


Result: $(4675.21)_8 = (100110111101.010001)_2$

Hexadecimal → binary

$$2^4 = 16$$

example: hexadecimal $(3ACD.A1)_{16} \rightarrow$ binary



Result: $(3ACD.A1)_{16} = (11101011001101.10100001)_2$

Data Representation

- What are two popular coding systems to represent data?
 - **ASCII**—American Standard Code for Information Interchange
 - **EBCDIC**—Extended Binary Coded Decimal Interchange Code

ASCII	Symbol	EBCDIC
00110000	0	11110000
00110001	1	11110001
00110010	2	11110010
00110011	3	11110011

Express the Data in Computer

$b_7 \quad b_6 \quad b_5 \quad b_4 \quad b_3 \quad b_2 \quad b_1 \quad b_0$

0 1 1 0 0 1 0 1



8 bits binary

ASCII Code

- ASCII stands for America Standard Code for Information Interchange
- ASCII is used to represent character data.
- For example:
 - Alphabet letter "a" can be represented as a series of eight binary digits, "01100001" using extended ASCII

ASCII codes for 'A'

'A' decimal code:	65_{10}
'A' hex code:	41_{16}
'A' binary code:	01000001_2
'A' octal code:	101_8
'A' escape sequence:	\x41
'A' HTML code:	A

Floating-Point Representation



- The signed magnitude, 1's complement, and 2's complement representations as such are not useful in scientific or business applications that deal with real number values over a wide range.
- Floating-point representation solves this problem.

Floating-Point Representation

- Computers use a form of scientific notation for floating-point representation
- Numbers written in scientific notation have three components:



Floating-Point Representation

- Computer representation of a floating-point number consists of three fixed-size fields:



- This is the standard arrangement of these fields.

Floating-Point Representation



- The one-bit sign field is the sign of the stored value.
- The size of the exponent field, determines the range of values that can be represented.
- The size of the significand determines the precision of the representation.

Floating-Point Representation



- The IEEE-754 *single precision* floating point standard uses an 8-bit exponent and a 23-bit significand.
- The IEEE-754 *double precision* standard uses an 11-bit exponent and a 52-bit significand.

For illustrative purposes, we will use a 14-bit model with a 5-bit exponent and an 8-bit significand.

IEEE-754 fp numbers - 1

32 bits:

1

8 bits

23 bits



$$N = (-1)^s \times 1.\text{fraction} \times 2^{(\text{biased exp.} - 127)}$$

- Sign: 1 bit
- Mantissa: 23 bits
 - We “normalize” the mantissa by dropping the leading 1 and recording only its fractional part
- Exponent: 8 bits
 - In order to handle both +ve and -ve exponents, we add 127 to the actual exponent to create a “biased exponent”:
 - $2^{-127} \Rightarrow$ biased exponent = 0000 0000 (= 0)
 - $2^0 \Rightarrow$ biased exponent = 0111 1111 (= 127)
 - $2^{+127} \Rightarrow$ biased exponent = 1111 1110 (= 254)

IEEE-754 fp numbers - 2

- Example: Find the corresponding fp representation of 25.75
 - $25.75 \Rightarrow 00011001.110 \Rightarrow 1.1001110 \times 2^4$
 - sign bit = 0 (+ve)
 - normalized mantissa (fraction) = 100 1110 0000 0000 0000 0000
 - biased exponent = $4 + 127 = 131 \Rightarrow 1000\ 0011$
 - so $25.75 \Rightarrow 0\ 1000\ 0011\ 100\ 1110\ 0000\ 0000\ 0000 \Rightarrow$
 $x41CE0000$
- Values represented by convention:
 - Infinity (+ and -): exponent = 255 (1111 1111) and fraction = 0
 - NaN (not a number): exponent = 255 and fraction $\neq 0$
 - Zero (0): exponent = 0 and fraction = 0
 - note: exponent = 0 \Rightarrow fraction is *de-normalized*, i.e no hidden 1

IEEE-754 fp numbers - 3

- Double precision (64 bit) floating point

64 bits: 1 11 bits

52 bits



$$N = (-1)^s \times 1.\text{fraction} \times 2^{(\text{biased exp.} - 1023)}$$

- Range & Precision:

- ◆ 32 bit:

- mantissa of 23 bits + 1 => approx. 7 digits decimal
 - $2^{\pm 127}$ => approx. $10^{\pm 38}$

- ◆ 64 bit:

- mantissa of 52 bits + 1 => approx. 15 digits decimal
 - $2^{\pm 1023}$ => approx. $10^{\pm 306}$

Find the corresponding fp representation of 29.25 in 32-bits

- Firstly, Write the number in binary notation
 - 29 => 00011101
 - 0.25=>010
 - 29.25 =>**00011101.01**
- Secondly, Find the exponent in binary notation
 - E=? (exponent) (eight bits due to 32-bits)
 - 00011101.010 =>0001.1101010 $\times 2^4$
 - E=4+127=131 => **10000011** ($2^n - 2$) / 2 = 127 for n = 8)
- Thirdly, Find the mantissa part in binary notation
 - M=? (fraction) (23 bits due to 32-bits)
 - 0001.**1101010** $\times 2^4$ => **1101010000000000000000000**
- Fourth, Find the sign bit
 - S=**0** because of the positive number (one bit due to 32-bits)

Find the corresponding fp representation of 29.25 in 32-bits

S-E-M

0 10000011 110101000000000000000000

For the Hexadecimal

0100 0001 1110 1010 0000 0000 0000 0000

4 1 E A 0 0 0 0

x41EA0000 In Hexadecimal Notation

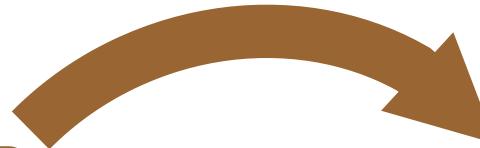
Data Representation

- How is a letter converted to binary form and back?



Step 1.

The user presses the capital letter **D** (shift+D key) on the keyboard.



Step 2.

An electronic signal for the capital letter **D** is sent to the system unit.



Step 3.

The signal for the capital letter **D** is converted to its ASCII binary code (01000100) and is stored in memory for processing.



Step 4.

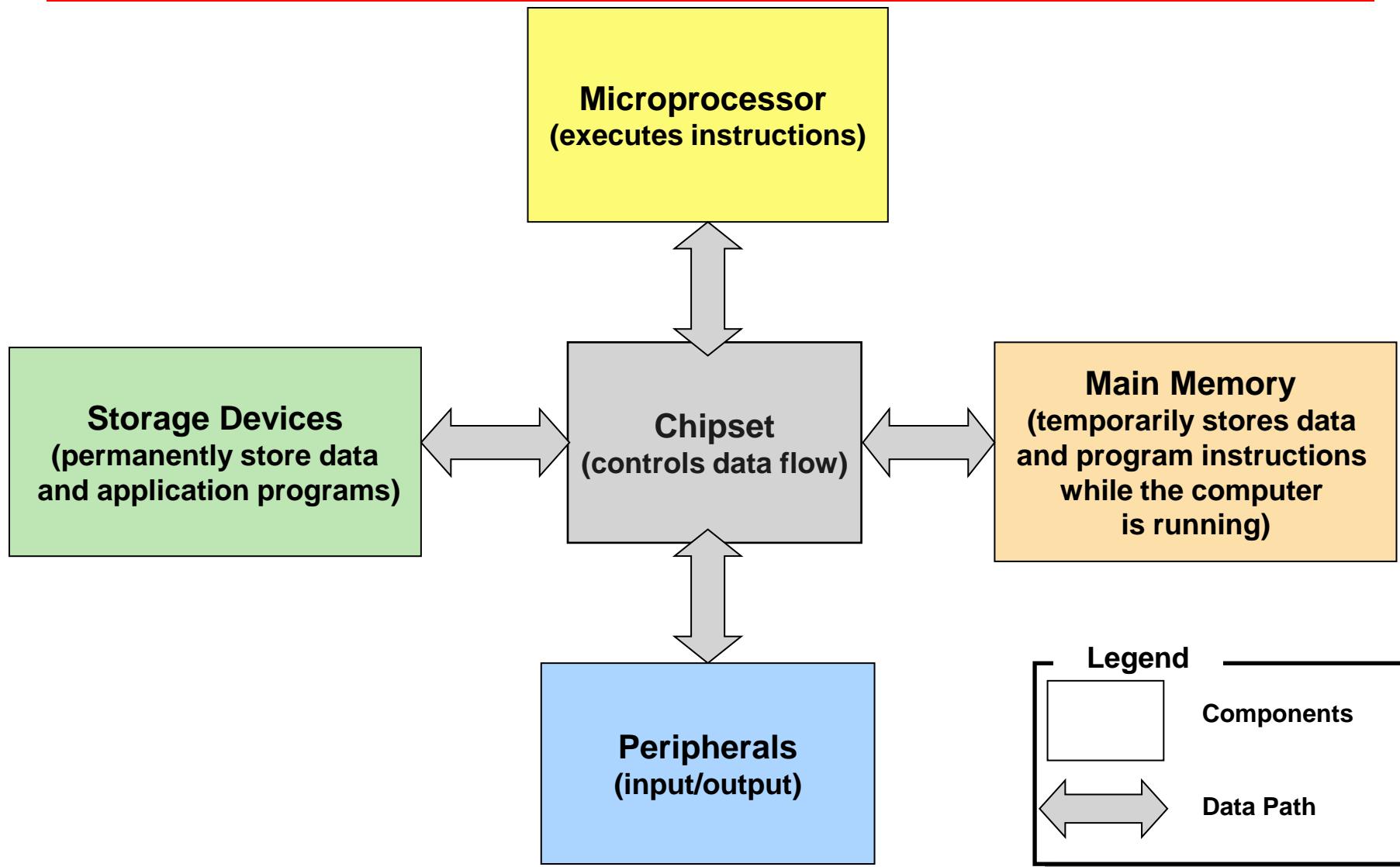
After processing, the binary code for the capital letter **D** is converted to an image, and displayed on the output device.





Overview of Hardware Components

Overview of Hardware Components



How a File is Displayed

The microprocessor sends instructions to the storage devices (via the chipset) requesting the specified file to be loaded into main memory.

Microprocessor
(executes instructions)

The microprocessor fetches the file contents from main memory.

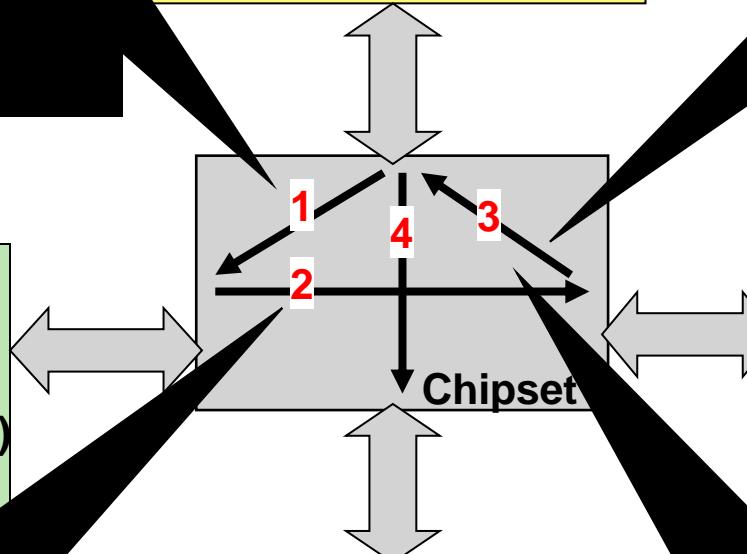
Storage Devices
(permanently store data and application programs)

Main Memory
(temporarily stores data and program instructions while the computer is running)

The storage devices send the file through the chipset to main memory.

Peripherals
(input/output)

Legend
Component
The microprocessor sends the display data to the monitor via the chipset.



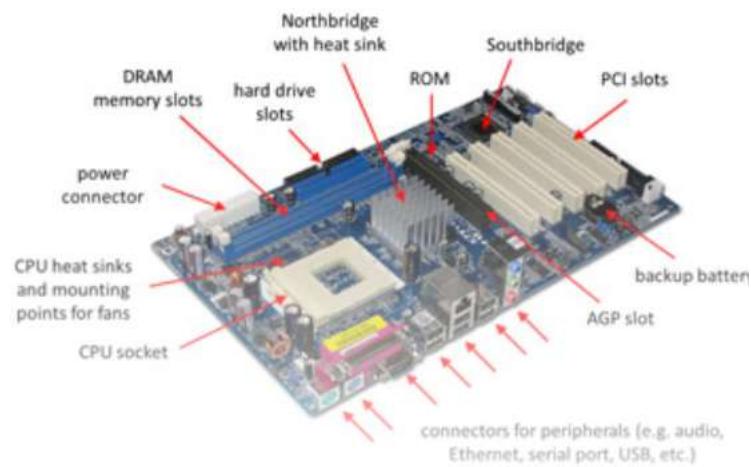
Inside the System Unit

- Essential electronic components used to process data
- Types of components:
 - Power supply
 - Motherboard
 - CPU
 - Hard disk drive
 - Memory (RAM/ROM)
 - Expansion cards



Parts of a Computer Motherboard

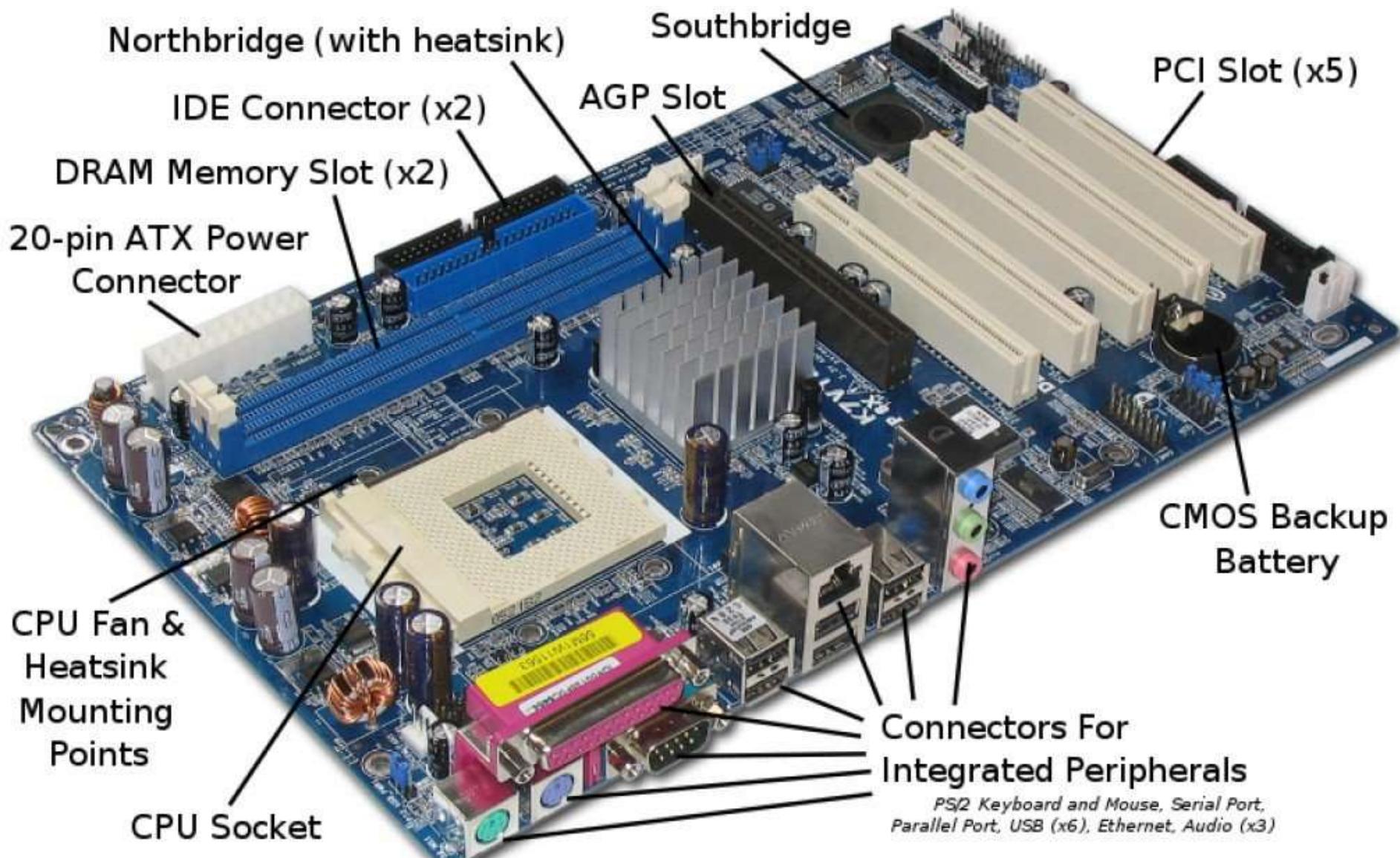
- Is the main circuit board inside the computer.
- Holds together many of the crucial components of a computer, including the central processing unit (CPU), memory and connectors for input and output devices.
- Contains a number of sockets and slots to connect the other components.
- Has tiny electronic circuits and other components on it.
- Connects input, output, and processing devices together (CPU, Memory, Hard Drive, DVD Drive)



Motherboard contains the central processing unit, the memory, and all the connectors to the rest of the hardware of the computer system.

The board is the 'mother' of all components - that's where it gets its name.

Components inside the System Unit



Central Processing Unit

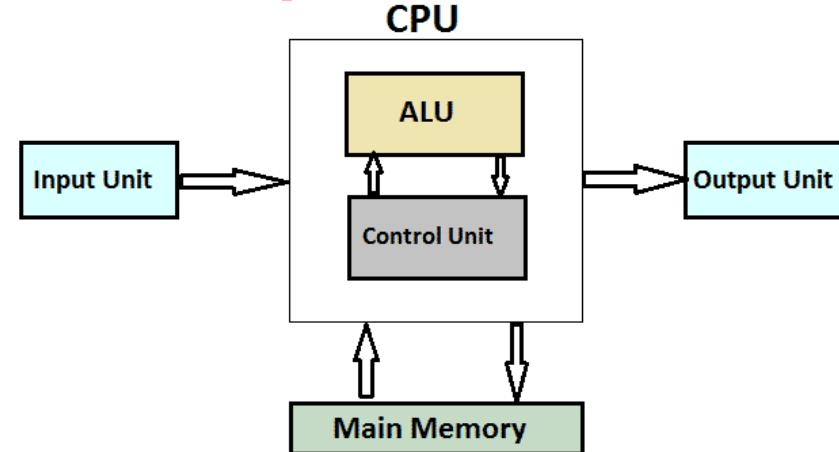


- CPU stands for Central Processing Unit.
- It is responsible for fetching, decoding, and executing program instructions as well as performing mathematical and logical calculations
- It does all decisions, calculations.
- It also controls other parts of a computer.

CPU consists of several section:

1. Control Unit (CU)
2. Arithmetic and Logic Unit (ALU)
3. Main Memory

Components of a CPU



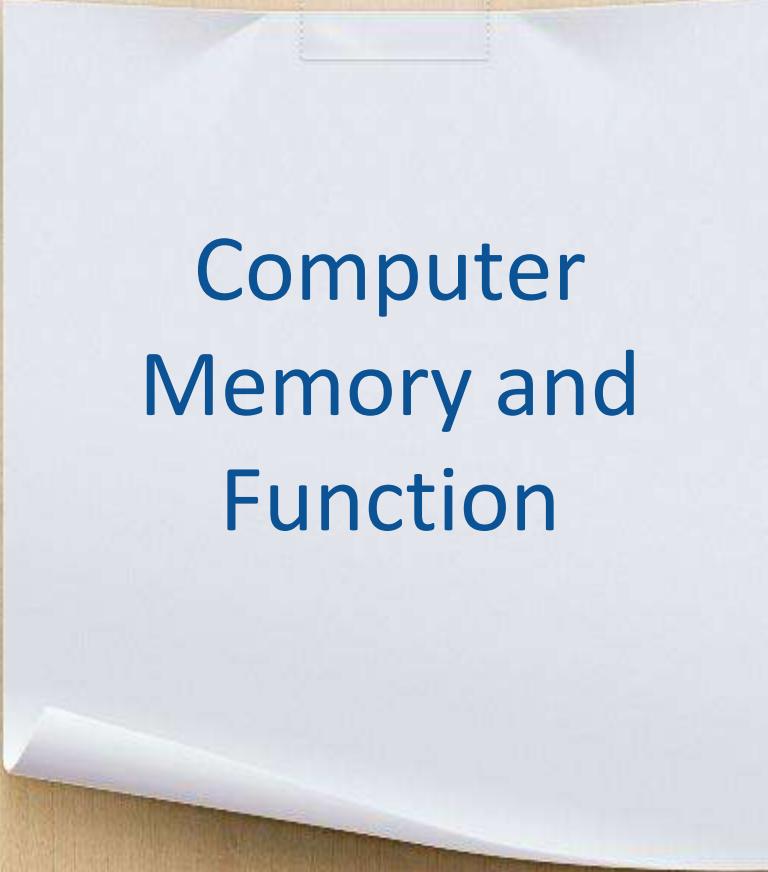
- Each of the section has its own function. They work together with other Peripherals to form a computer.

Control Unit

- The Control Unit is an internal part of a CPU that co-ordinates the instructions and data flow between CPU and other components of the computer.
- It is the CU that directs the operations of a central processing unit by sending timing and control signals.

Arithmetic Logic Unit

- The ALU is an internal electronic circuitry of a CPU that performs all the arithmetic and logical operations in a computer.
- The ALU receives three types of inputs.
 - Control signal from CU (Control Unit)
 - Data(operands) to be operated
 - Status information from operations done previously.



Computer Memory and Function

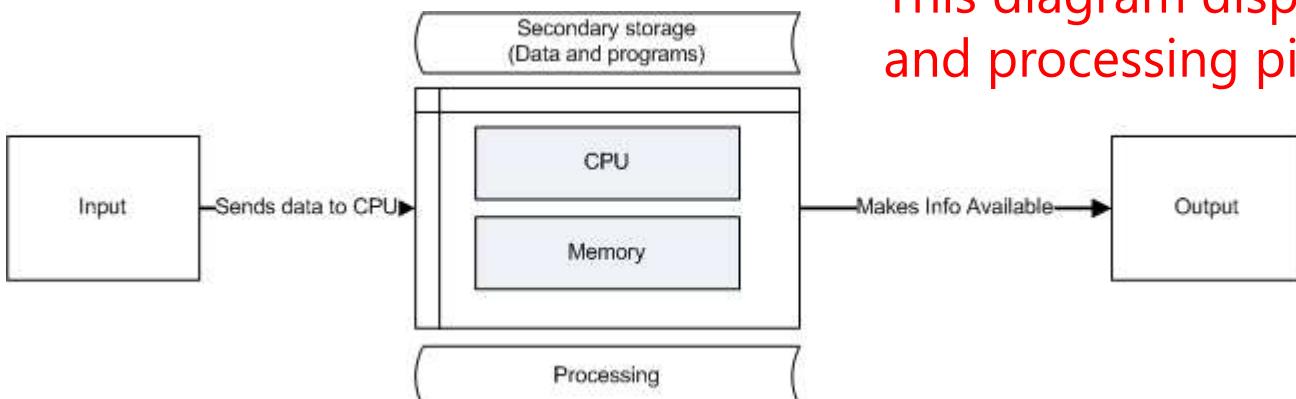
Computer Memory and Function

So, what is computer memory, and why is it so important?

- **Computer memory** is technically any type of electronic storage. Without it and without access to it, a computer is just a useless box.
- From startup to shutdown, and all processes in between, a computer relies on several types of memory in order to function.

At the core of the computer is the **central processing unit or CPU**, the source of control that runs all programs and instructions. In order to function, computers use two types of memory: primary and secondary. The main storage is the primary memory, and data and programs are stored in secondary memory.

This diagram displays all inputs/outputs and processing pieces of a computer.



Primary Memory - RAM and ROM

- Memory is where information is stored and retrieved by the CPU.



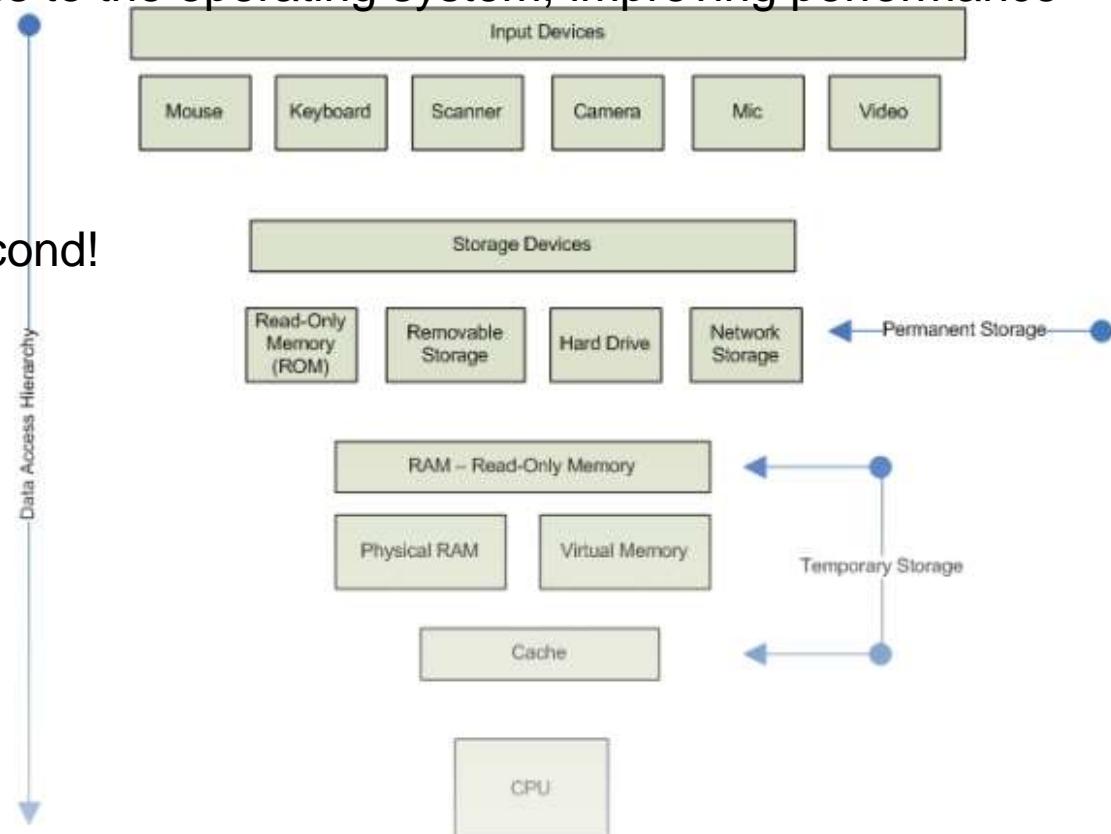
- RAM: Random Access Memory (RAM)
- It is a memory scheme within the computer system responsible for storing data on a temporary basis, so that it can be promptly accessed by the processor as and when needed.
- It is volatile in nature, which means that data will be erased once supply to the storage device is turned off.
- RAM stores data randomly and the processor accesses these data randomly from the RAM storage.
- RAM is considered "random access" because you can access any memory cell directly.



- ROM (Read Only Memory):
- ROM is a permanent form of storage.
- ROM stays active regardless of whether power supply to it is turned on or off.
- ROM devices do not allow data stored on them to be modified.

How a Computer Uses Memory

- Once the computer is turned on, the computer accesses read-only memory (ROM) and makes a quick test of the pieces of memory to ensure there are no errors.
- Next, the computer starts the basic input/output (BIOS) from the ROM.
- The operating system is started after the BIOS makes it through the startup routine; the operating system is loaded into RAM.
- This gives the CPU quick access to the operating system, improving performance and functionality.
- The CPU accesses this in a continuous cycle—and it happens millions of times per second!

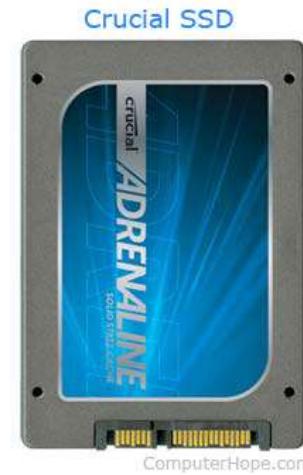
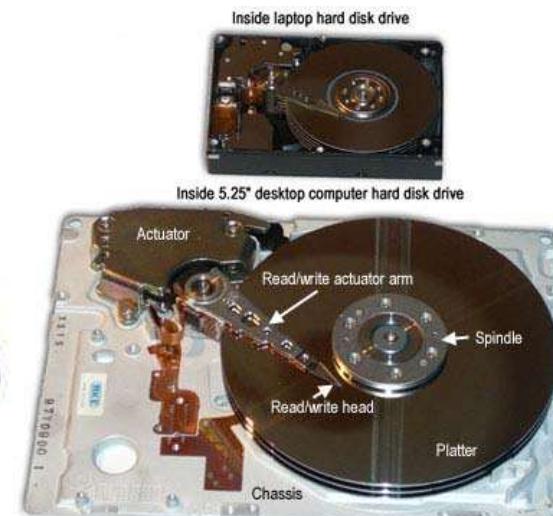
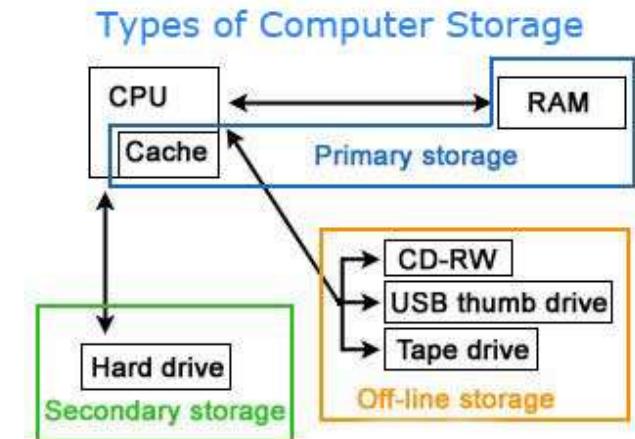


Secondary Memory

- Stores data and programs permanently : its retained after the power is turned off.
- Secondary memory refers to storage devices, such as hard drives and solid state drives.
- It may also refer to removable storage media, such as USB flash drives, CDs, and DVDs.

Examples of secondary storage

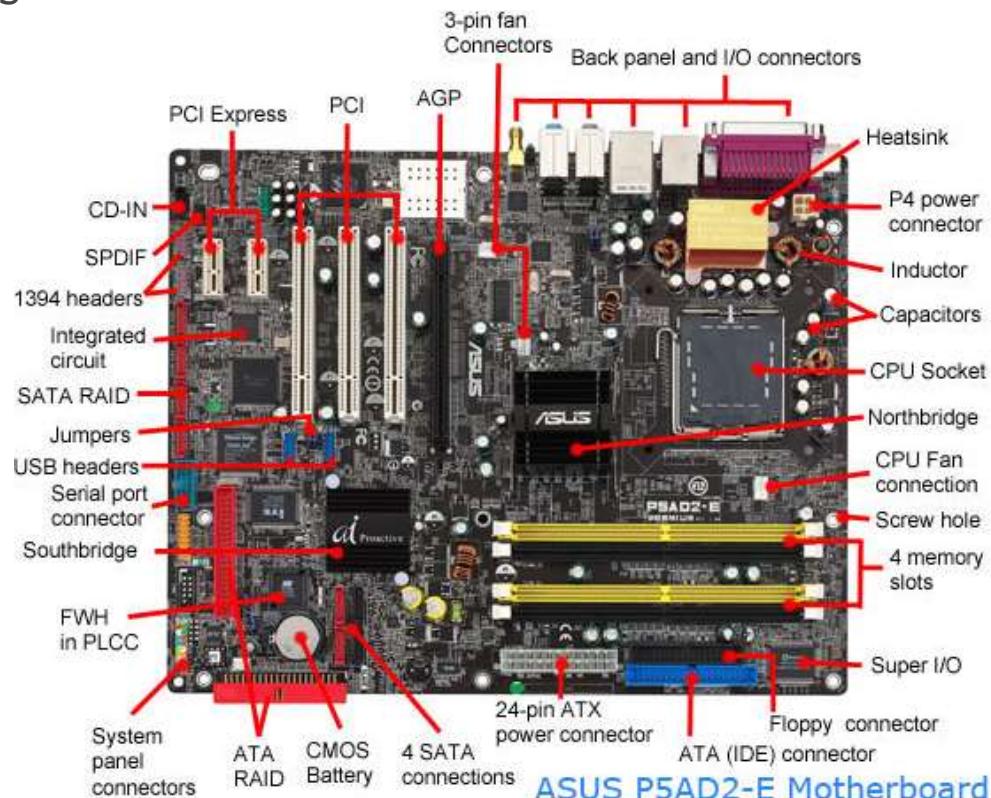
- Hard drive (HDD)
- Solid-state drive (SSD)
- USB thumb drive
- SD card
- CD
- DVD
- Floppy diskette
- Tape drive



Computer expansion slots

- **AGP** - Video card
- **AMR** - Modem, Sound card
- **CNR** - Modem, Network card, Sound card
- **EISA** - SCSI, Network card, Video card
- **ISA** - Network card, Sound card, Video card
- **PCI** - Network card, SCSI, Sound card, Video card
- **PCI Express** - Video card, Modem, Sound Card, Network Card
- **VESA** - Video card

- Many of the above expansion card slots are obsolete.
- You're most likely only going to encounter AGP, PCI, and PCI Express when working with computers today.

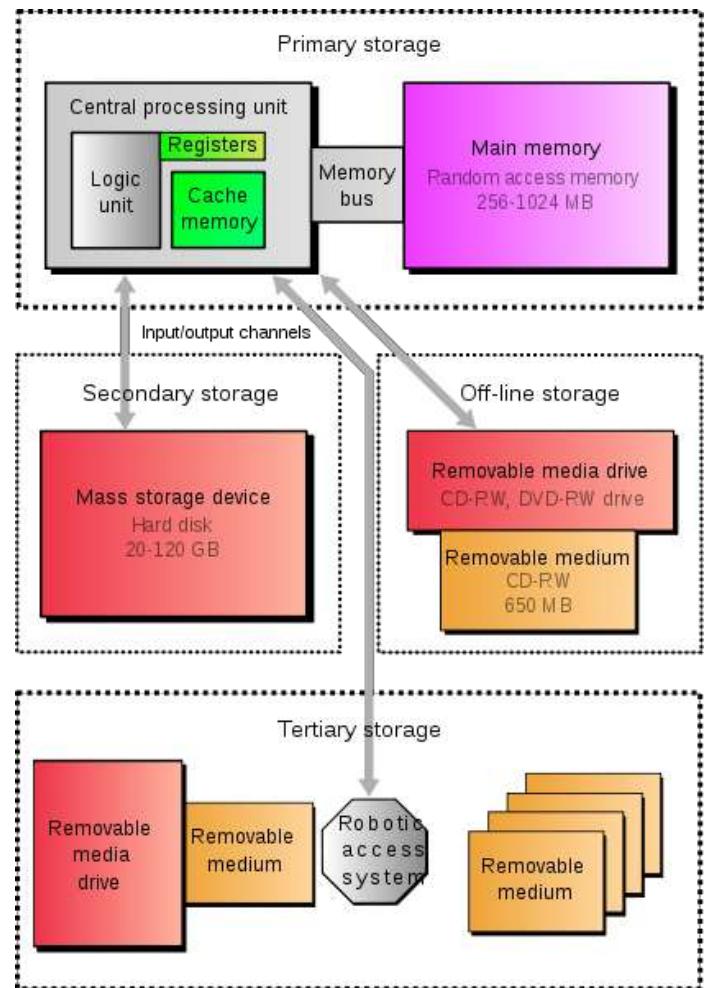


Storage Devices

Types of Storage

There are four type of storage:

- Primary Storage
- Secondary Storage
- Tertiary Storage
- Off-line Storage



Storage Devices

Primary Storage

- Also known as **main memory**.
- Main memory is directly or indirectly connected to the central processing unit via a memory bus.
- The CPU continuously reads instructions stored there and executes them as required.
- Example:
 - RAM
 - ROM
 - Cache

Cache is a high-speed access area that can be either a reserved section of main memory or a storage device.

Storage Devices

Tertiary Storage

- Typically it involves a robotic mechanism which will mount (insert) and dismount removable mass storage media into a storage device.
- It is a comprehensive computer storage system that is usually very slow, so it is usually used to archive data that is not accessed frequently.
- This is primarily useful for extraordinarily large data stores, accessed without human operators.
- Examples:
 - Magnetic Tape
 - Optical Disc



Storage Devices

Tertiary Storage

Optical Disc

- **Optical disc** is any storage media that holds content in digital format and is read using a laser assembly is considered optical media.
- The most common types of optical media are
 - Blu-ray (BD)
 - Compact Disc (CD)
 - Digital Versatile Disc (DVD)

Storage Devices

Off-line Storage

- Also known as **disconnected storage**.
- Is a computer data storage on a medium or a device that is not under the control of a processing unit.
- It must be inserted or connected by a human operator before a computer can access it again.

Storage Devices

Off-line Storage Examples:

Floppy Disk

Zip diskette

USB Flash drive

Memory Card



Secure Digital card (SD)



MiniSD



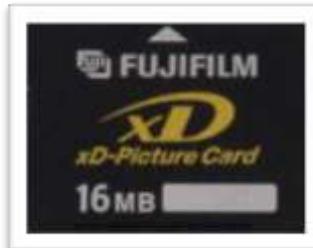
Compact Flash



Memory Stick



MultiMedia card



XD-Picture card



Memory card reader

Storage Devices

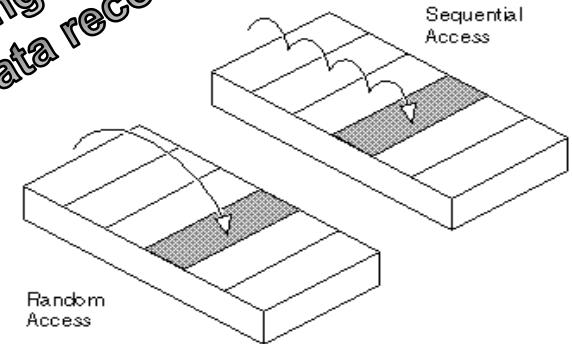
Storage Device Features

- Volatility
- Accessibility
- Mutability
- Addressability

Volatile Memory
RAM

Non-Volatile Memory
ROM

Reading or writing
data records



Allows information to be overwritten at any time.

Three types of mutability:

- Read/write storage or mutable storage
- Read only storage
- Slow write, fast read storage

Addressability

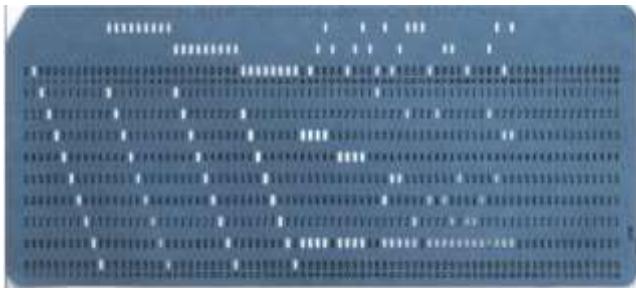
- Three types of addressability
- Location-addressable
- File addressable
- Content-addressable

Storage Devices

Other Example of Storage Devices

- Punch card
- Cloud storage
- RAID

Punched Card



Early method of data storage used with early computers

Cloud Storage



RAID disk drives are used frequently on servers

RAID allows you to store the same data redundantly (in multiple places) in a balanced way to improve overall storage performance.

End of Unit 2

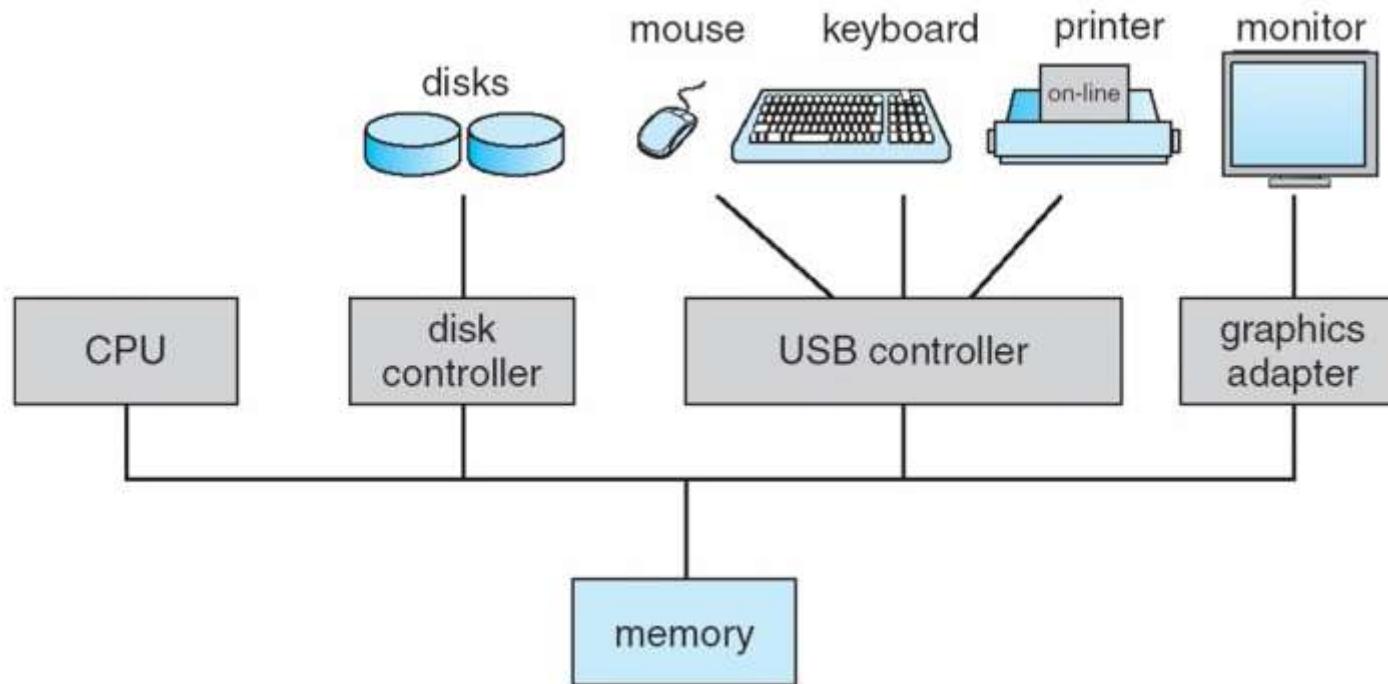


Unit 3. Operating System Software

- Structure
- Device Management and Configuration
- Resource sharing
- File Systems

Computer System

- One or more CPUs
- Device controllers (I/O modules)
- Memory
- Bus
- Operating system ?

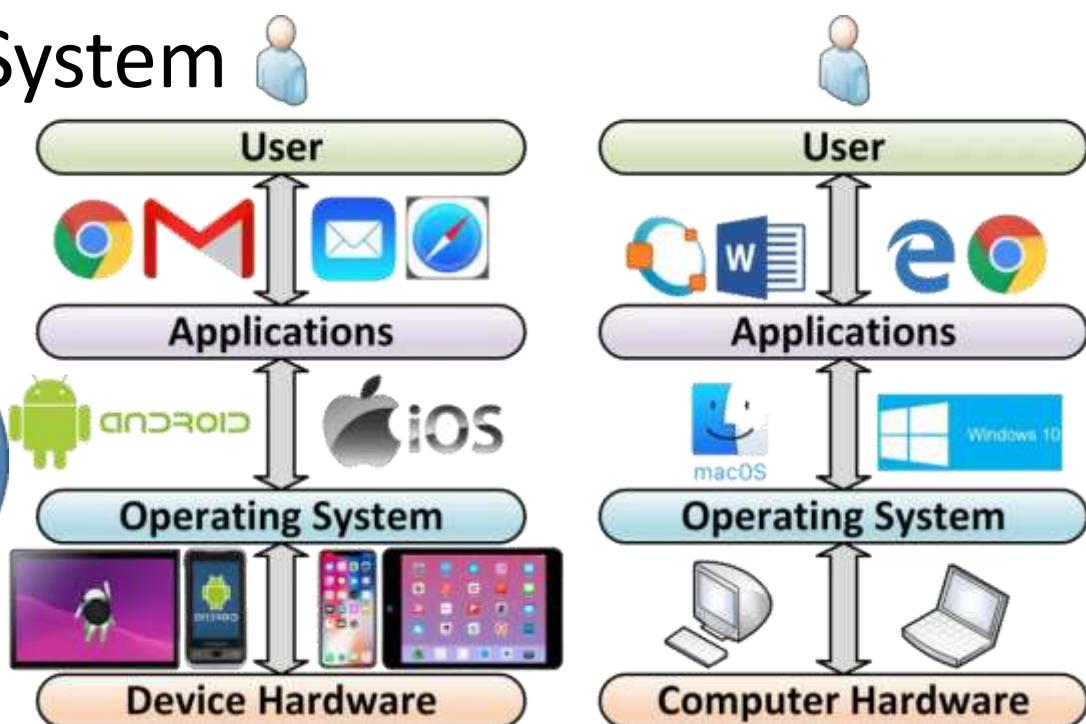
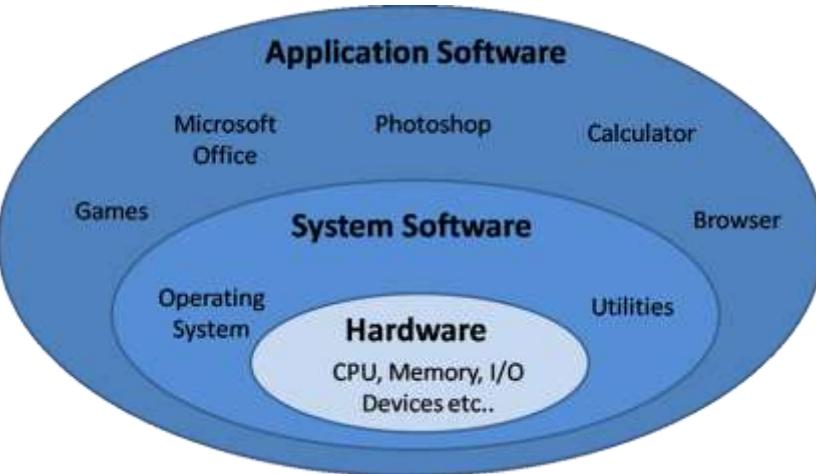


What is an Operating System

An Operating System is a program that controls the execution of user programs and acts as an intermediary between users and computer hardware

- It is a software layer between application programs and computer hardware

Layers of a Computer System



Layers of Organization

Layer	People	Domain	
Application Programs	Application Programmers	Software	
System Utility Programs	System Programmers		
Operating System			
I/O System (BIOS)			
Computer System	Computer Engineers	Hardware	
CPU	Computer Architects		
Memories, Logic Circuits, Flip-Flops, Gates	Logic Designers		
Transistors, Diodes, Resistors, Power Supplies	Materials Scientists		

Computer System Components

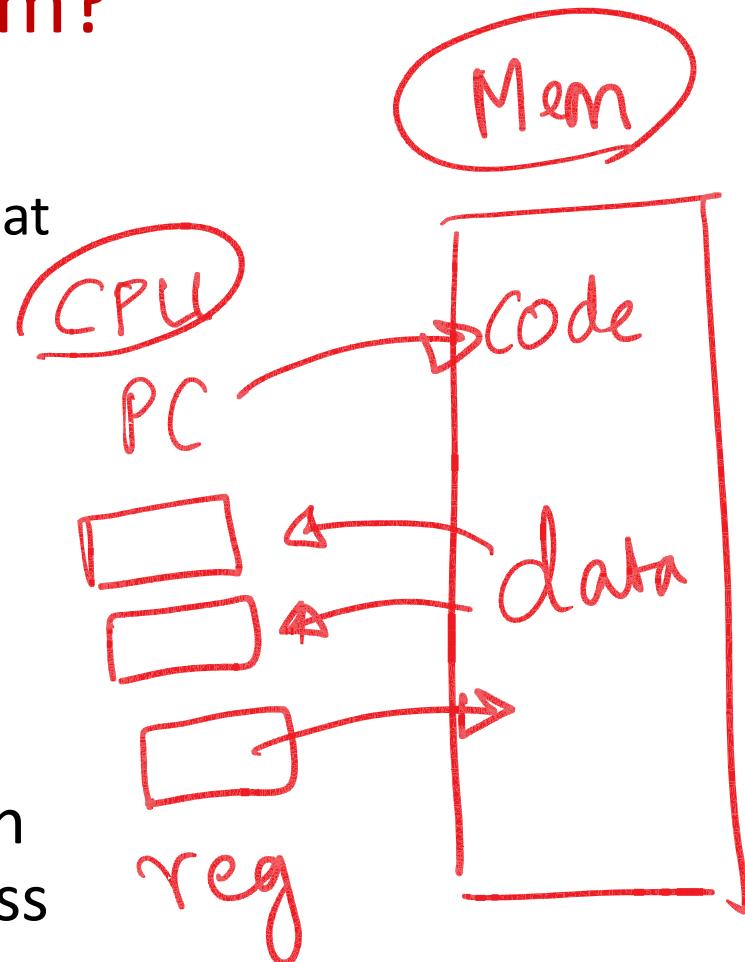
- Hardware
 - Basic computing resources: processor (CPU), memory, I/O devices
- Operating system
 - Controls and coordinates the use of this hardware among multiple programs running on a computer
- Application program
 - Solve user-specific problems: compilers, database systems, business applications
- User
 - People, other application programs (inter-process communication, distributed systems)

What happens when you run a program? (Background)

- A compiler translates high level programs into an executable (“.c” to “a.out”)
- The exe contains instructions that the CPU can understand, and data of the program (all numbered with addresses)
- Instructions run on CPU: hardware implements an instruction set architecture (ISA)

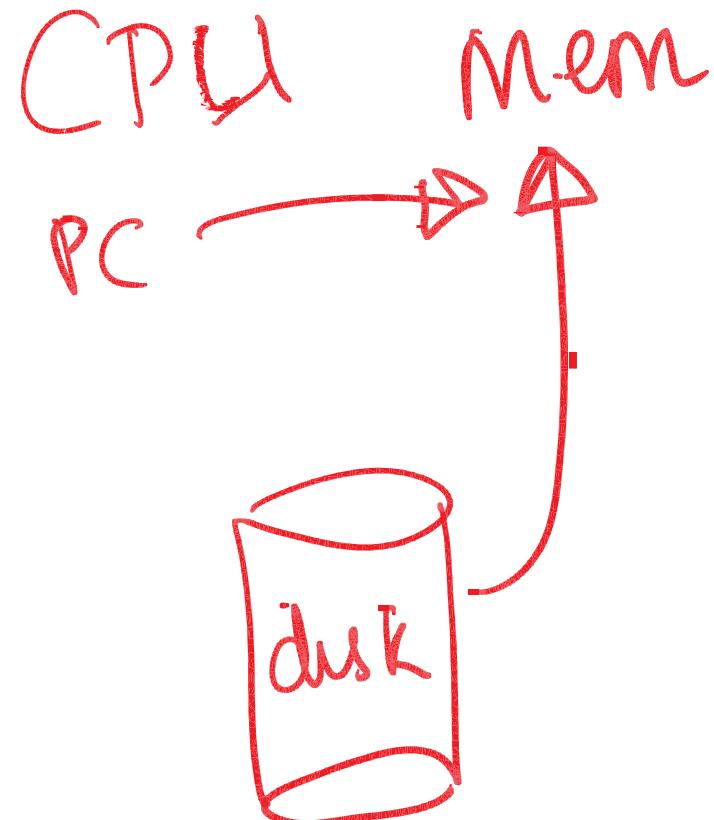
So, what happens when you run a program?

- To run an exe, CPU
 - fetches instruction pointed at by PC from memory
 - loads data required by the instructions into registers
 - decodes and executes the instruction
 - stores results to memory
- Most recently used instructions and data are in CPU caches for faster access



So, what does the OS do?

- OS manages program memory
 - Loads program executable (code, data) from disk to memory
- OS manages CPU
 - Initializes program counter (PC) and other registers to begin execution
- OS manages external devices
 - Read/write files from disk.

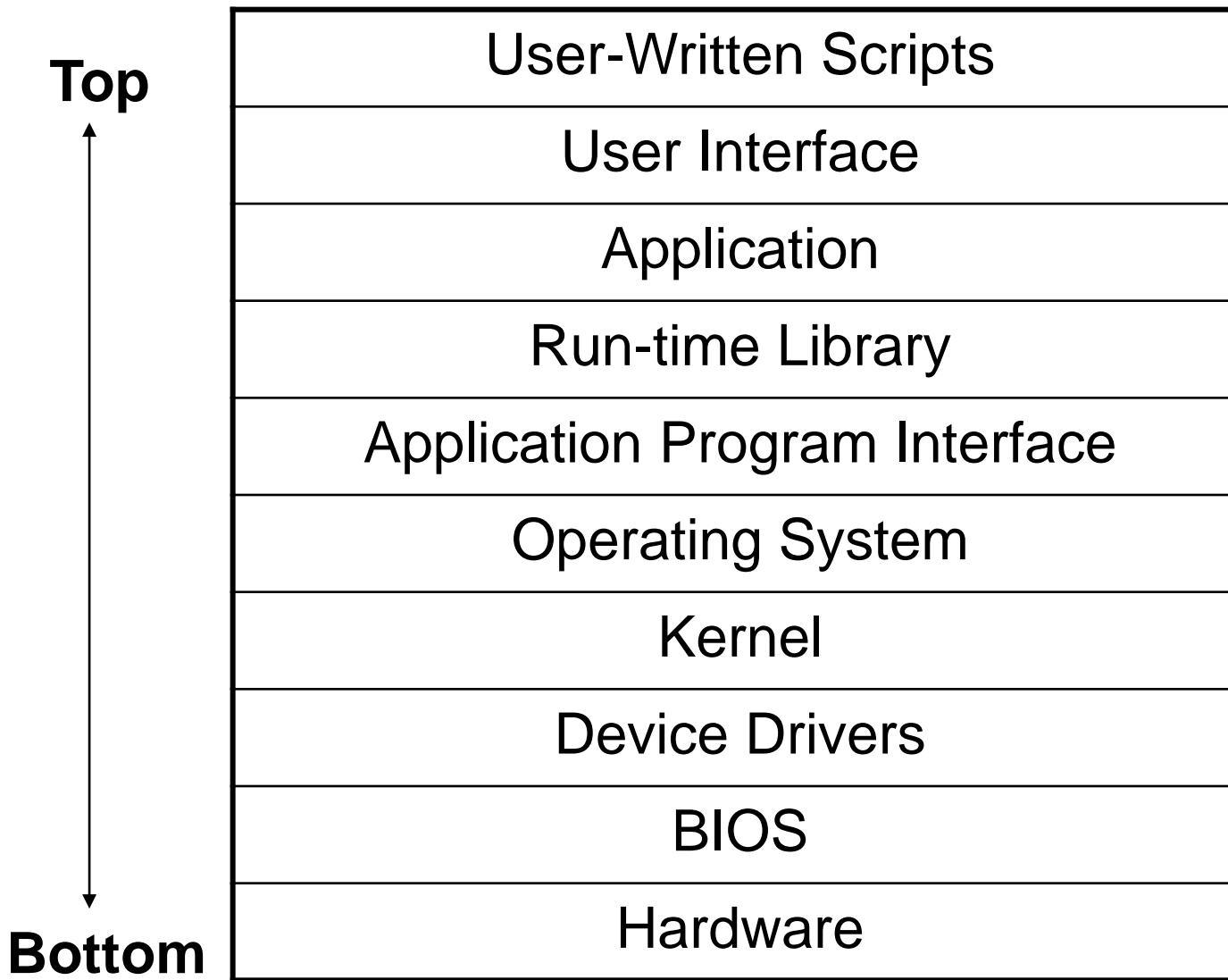




Structure



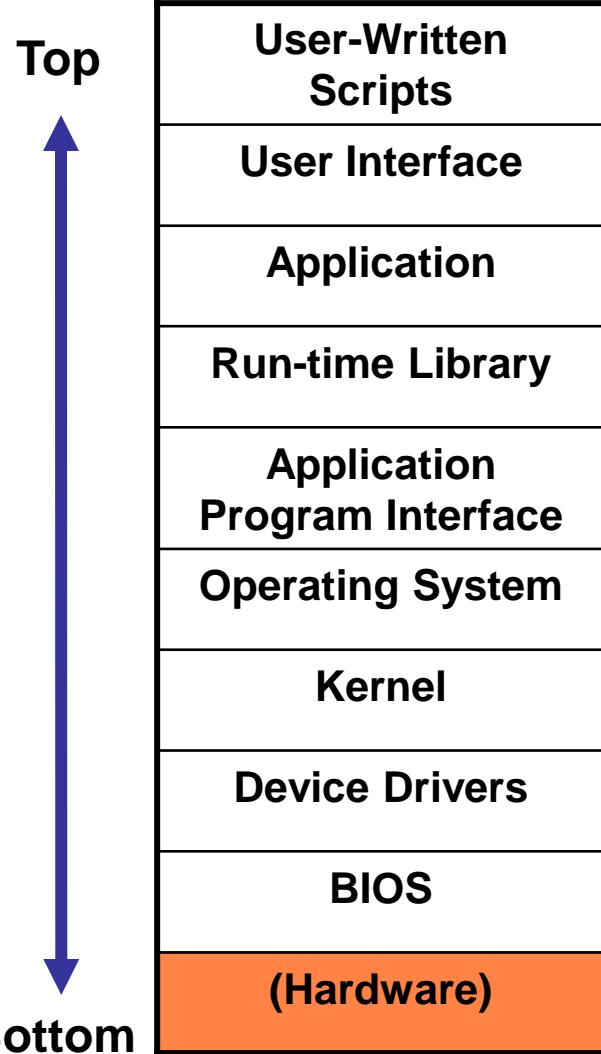
Layers of Software





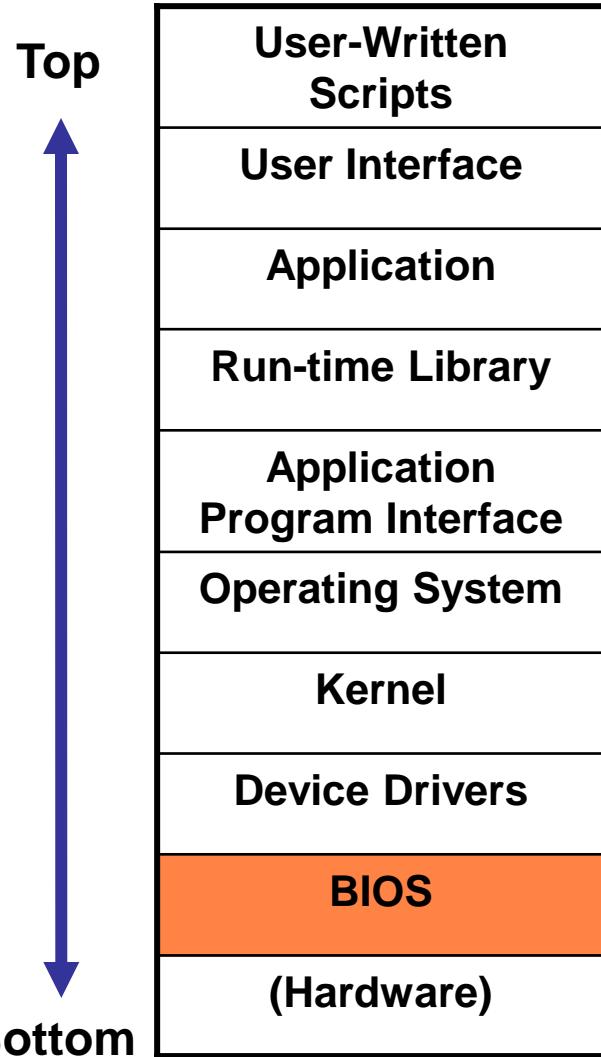
Encapsulation and Abstraction

- **Encapsulation** means that each layer needs only a limited amount of knowledge to do its job
 - Organizing software into layers that are relatively independent keep the entire system manageable, and afford greater efficiencies
- **Abstraction** means how the software layers communicate, beyond the view of the user



Hardware

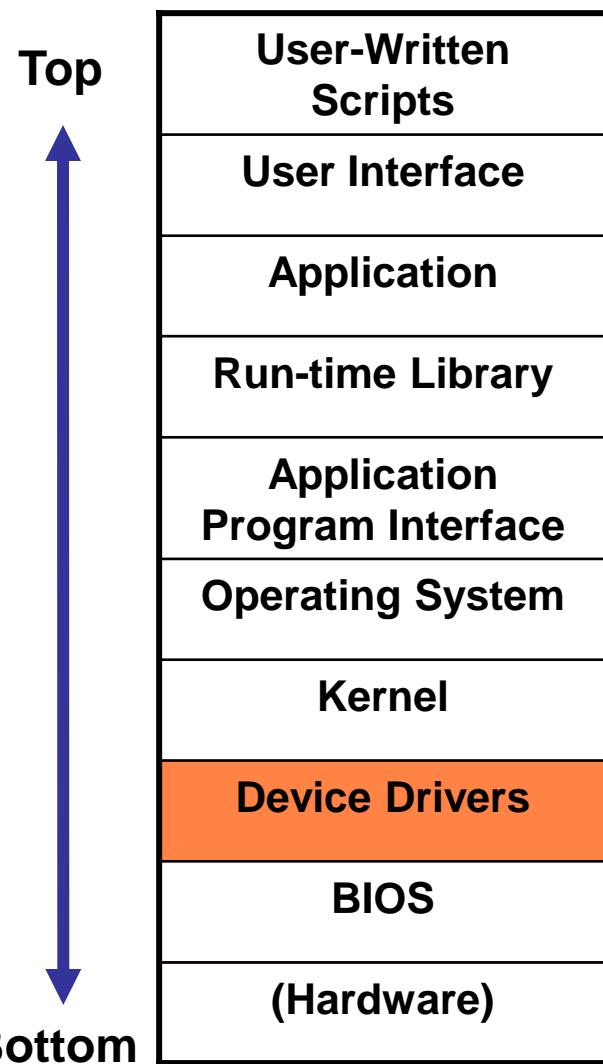
- Lowest level of the computer
- The physical components from which the computer system is constructed



BIOS

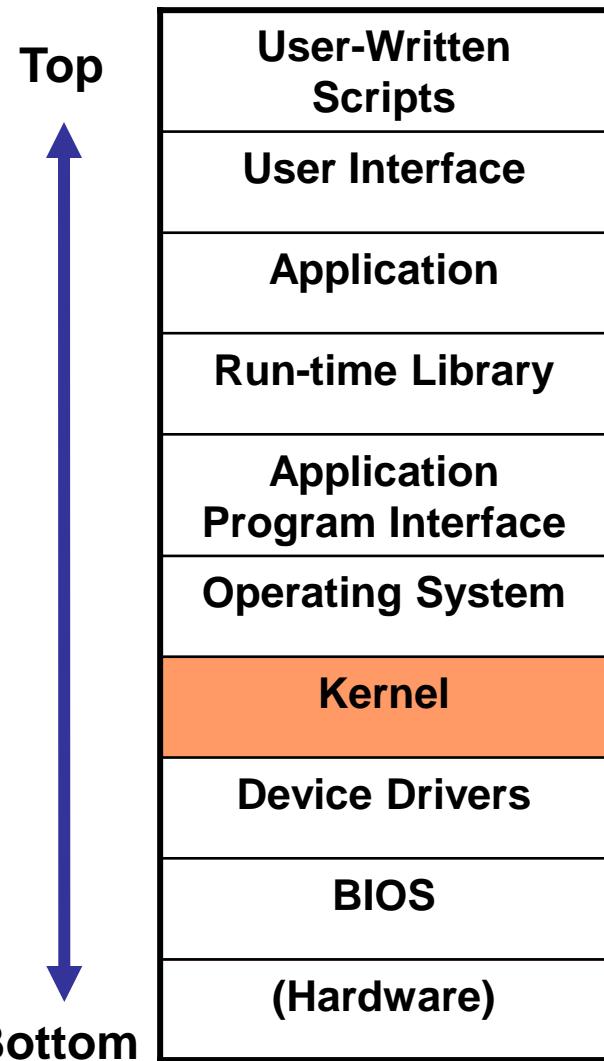
- Basic Input/Output System
- Most primitive level of software
- Deals directly with the signals that control each hardware component
- Most of its work is done when the system first boots up.

Device drivers

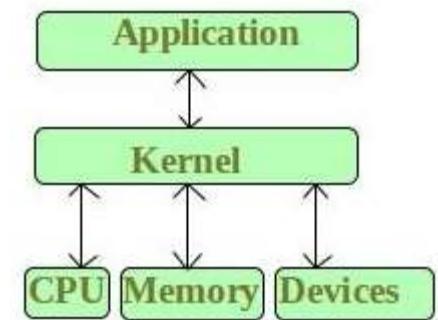


- Helper programs used by Operating systems to control a device
- In order to add new hardware, the right device driver must be present.
- Provided by the device manufacturer in CD or other storage media
- Instructions are to be followed to install the device and its drivers.
- Most of the operating systems have such drivers stored in it.

Kernel



- is the core part of an operating system which manages system resources.
- acts like a bridge between application and hardware of the computer.
- The sole aim of the kernel is to manage the communication between the software (user level applications) and the hardware (CPU, disk memory etc).
- The kernel is **responsible for**
 - Memory management
 - Process and task management
 - Disk management.
 - Interrupt Handling



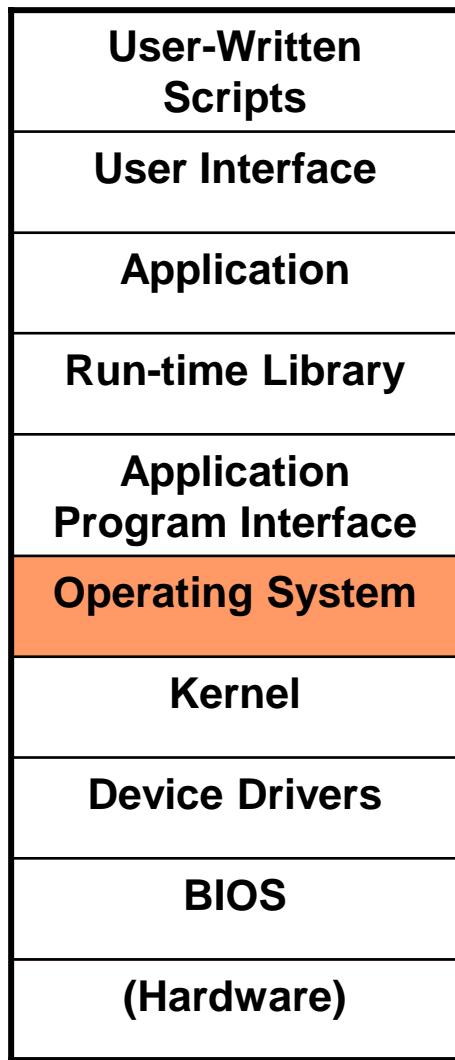


Operating System (OS)

Top



Bottom



- Implements all other functions the OS is to perform
 - File system management
 - Communicates with the kernel when basic actions such as data transfer operation to a peripheral
- Master controller of all the activities of the computer
- Sets standards for all the application software used in a computer system
- Different operating systems have different user interfaces and run same applications
- Examples: Microsoft Windows, UNIX, LINUX, Mac OS, iSeries



Layers of Software: Operating System (continued)

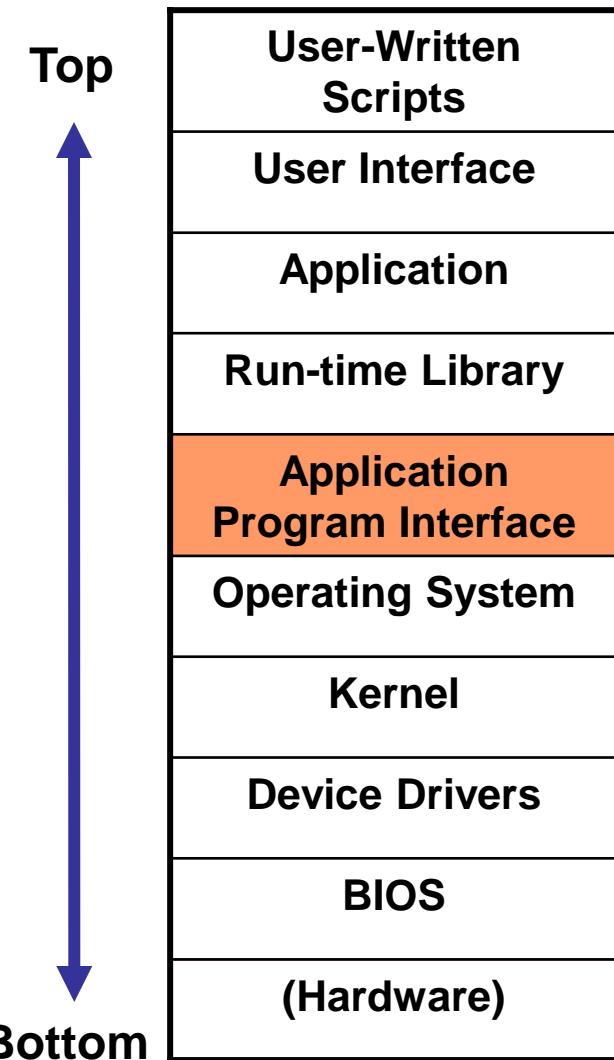
- **External Services** of OS:
 - Help users start programs
 - Manage stored data
 - Maintain security of the system
 - Provides ways to select an application program, find, rename and delete documents and other data stored on disk
- **Internal services** of OS:
 - controls input and output
 - Allocates system resources (e.g. memory, disk drive capacity, processor time)
 - Manages storage for programs and data
 - Detects equipment failures



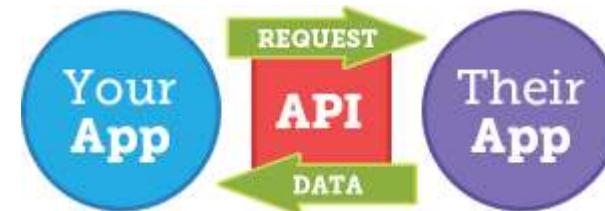
Layers of Software: Operating System (continued)

- Operating systems can be classified into two categories:
 - A ***server operating system*** is designed for computers that provide centralized storage facilities and communications capabilities for networks and Web sites.
 - A ***desktop operating system*** is designed for a single-user microcomputer.

Application Program Interface (API)

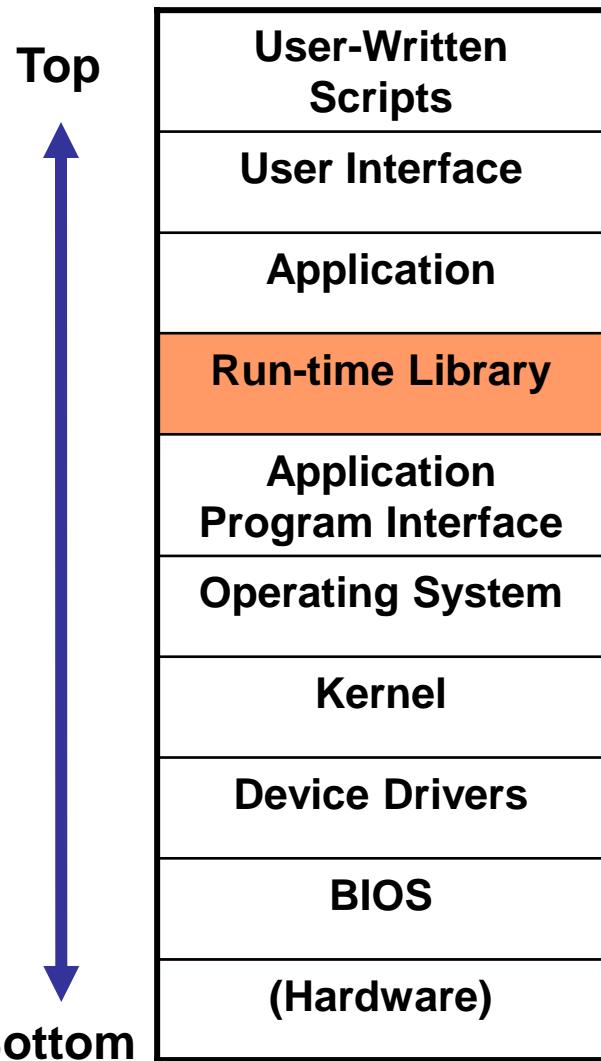


- A set of routines, protocols, and tools for building software applications
- Abstraction defined by OS for applications
- Application communicates with OS through the API.



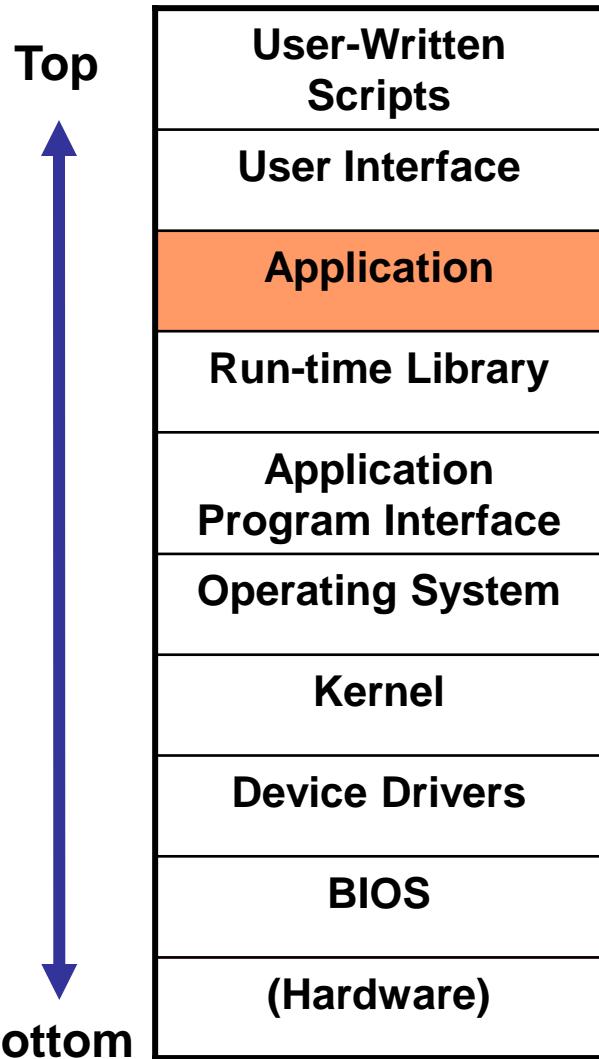
Please, Click

Run time Libraries



- A library of routines that are bound to the program during execution
- Collection of Software routines which application programs rely on
- Typically, it consists of many different programs or functions that are commonly used in various programs.
- These include I/O routines, graphical functions, mathematical functions and more.

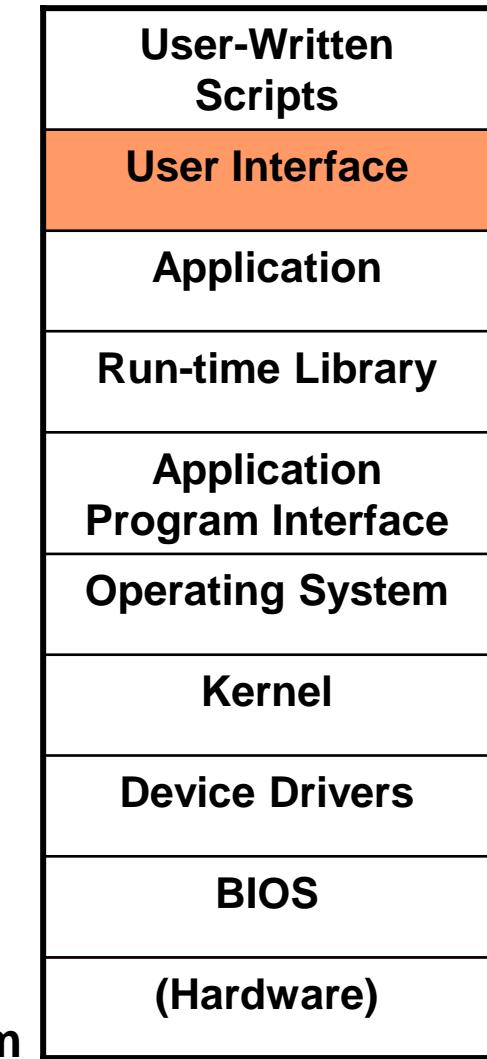
Application



- Layer where the routines perform tasks the application is designed to do.
- Also referred to as an application program or application software.
- Is a computer software package that performs a specific function directly for an end user or, in some cases, for another application.
- An application requests services from and communicates with other technologies via an application programming interface (API).
- Examples of applications include word processors, database programs, web browsers, development tools, image editors and communication platforms.



Top

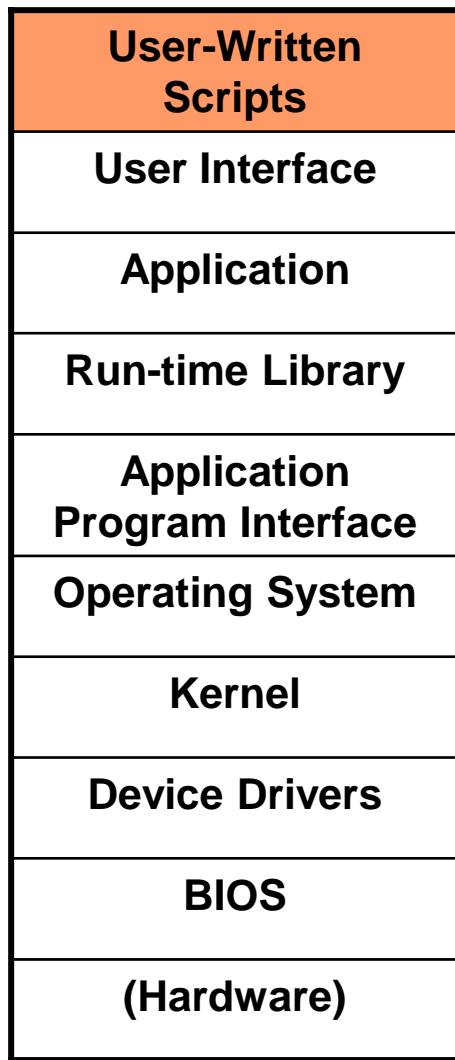


User interface

- Responsible for the communication between the application and the user
- Typically it is a **GUI**, composed of buttons and pull-down menus
- The GUI passes the information to the application

Scripts or macros

Top



- Routines that many applications use to allow users to create documents using the application's built-in commands.
- Allow users to automate sequences of actions they perform frequently
- Can perform any function that does not require additional user input
- Scripts are located above the application layer in the software hierarchy because they are built from application-level commands.



Windows OS

- Windows 95/98/NT/ME/2000/XP/Vista/7/10
 - Widely used in PCs
 - Supports a vast array of applications and peripheral devices
 - Provides icons, buttons, menus and various other graphical objects that can be manipulated by a mouse
 - Provides a command-line interface
 - Supports **multitasking** (running more than one program at a time)
- Designed to run high-end and complicated tasks such as video editing, scientific visualization, and computer aided design
- Provide reliability, security, and support for software applications



WINDOWS 10



Mac OS

- In 1984, Apple Computer introduced the revolutionary Lisa computer.
- The Macintosh computer, with its graphical user interface, **Mac OS**, was a major factor contributing to its success.





Mac OS

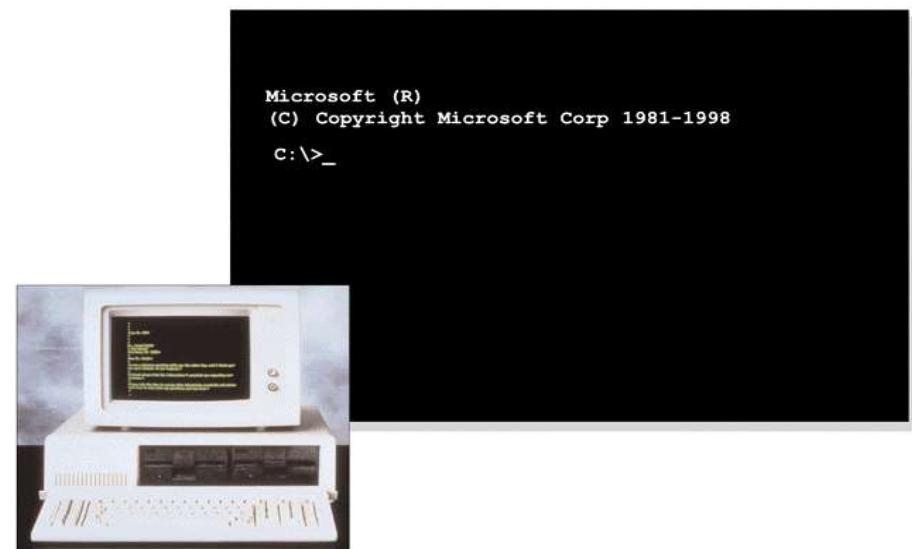
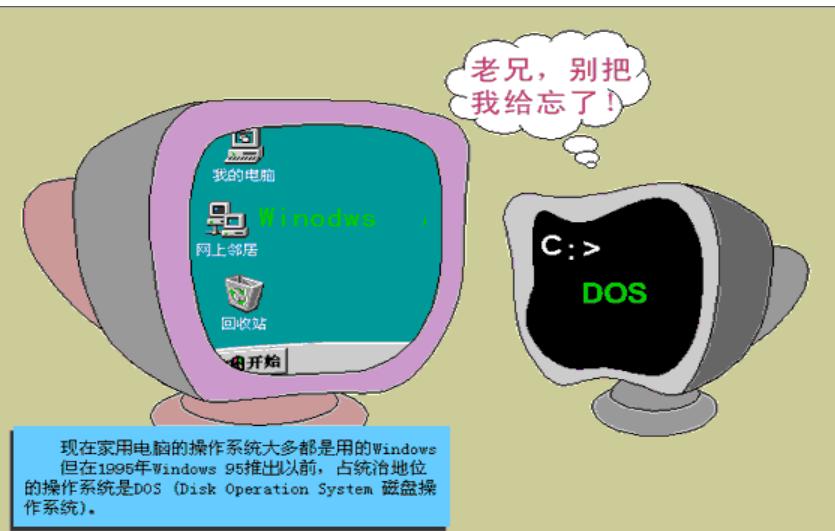
- Contains graphical user interface featuring menus and icons
- OS interface through keyboard or mouse
- Software applications that are compatible with Mac OS are called Mac software.
- Fewer software are compatible with Mac OS than Windows OS.
- Mac OS has good graphical application software support.
- Some hardware and software add-ons enable Windows software to run on Mac OS.

MAC OS



DOS

- **DOS** stands for *disk operating system*.
 - Developed by Microsoft and introduced in IBM-PC.
 - Uses command-line interface.
 - Has been incorporated into Windows OS
 - Operates behind the scenes so Windows users do not have to memorize and type complex commands



Windows Server, NetWare, UNIX and LINUX

- Computer providing centralized storage and communications services requires Server OS
- User interface and appearance similar to Desktop OS
- Differs in managing large flow of data on large networks and web sites



Windows Server, NetWare, UNIX and LINUX (continued)

- ***UNIX and LINUX:***
 - Developed for mini and micro computer networks and web servers of all sizes.
 - Variation of UNIX is LINUX, which is has a stable and secure OS.
 - UNIX and LINUX are suitable for servers and high-end workstations.
 - A GUI environment is provided in UNIX and LINUX for ease of operation.



The Roles of the BIOS

- The BIOS performs **three major functions**
 - initializes the hardware when the computer is first turned on
 - loads the OS
 - provides basic support for devices such as the keyboard, mouse, and serial ports
- The BIOS resides on a **ROM** chip
 - Non-volatile
 - Slower than DRAM
- Loads itself into **DRAM**
- Uses **CMOS**
 - CMOS is powered by battery, therefore, it is volatile
 - Contains BIOS parameter settings for hardware and memory speed



BIOS (continued)

- The BIOS initiates the ***POST*** (Power-On Self Test) sequence
 - Enables the video card
 - Counts and tests memory
 - Checks for expansion cards and initializes them
 - Follows a search order to find the ***Master Boot Record***
- A program is invoked to load the operating system once the **MBR** is found



Process Control

- Keeps track of all the processes running
- Process is an instance of a running program
- Process includes a set of memory pages, a set of open file descriptors (if the process has any I/O), a process ID, etc.
- Kernel maintains a queue of processes
- On a UNIX machine, the **ps** and **top** commands display process information.

Task Manager

File Options View

Processes Performance App history Startup Users Details Services

Name	Status	14% Memory	2% CPU	0% Disk	1% Network	1% GPU	GPU Eng
> Google Chrome (11)		315.5 MB	0.3%	0.1 MB/s	0 Mbps	0%	GPU C
> Microsoft PowerPoint		181.5 MB	0%	0 MB/s	0 Mbps	0%	
> mysql.exe (32 bit)		151.7 MB	0%	0 MB/s	0 Mbps	0%	
> Photos	∅	104.6 MB	0%	0 MB/s	0 Mbps	0%	
> ESET Service		55.4 MB	0.1%	0 MB/s	0 Mbps	0%	
Desktop Window Manager		52.1 MB	0%	0 MB/s	0 Mbps	0%	
> Cortana (2)	∅	46.8 MB	0%	0 MB/s	0 Mbps	0%	
> Windows Explorer		45.7 MB	0%	0 MB/s	0 Mbps	0%	
> Killer Network Service		43.9 MB	0.1%	0 MB/s	0 Mbps	0%	
> Microsoft Office Click-to-Run ...		28.6 MB	0%	0 MB/s	0 Mbps	0%	
> Windows Shell Experience Host	∅	26.8 MB	0%	0 MB/s	0 Mbps	0%	
> Service Host: Diagnostic Policy ...		25.2 MB	0.1%	0 MB/s	0 Mbps	0%	
> Task Manager		21.8 MB	0.1%	0 MB/s	0 Mbps	0%	
Windows Audio Device Graph Is...		21.8 MB	0.1%	0 MB/s	0 Mbps	0%	
ESET Main GUI		21.7 MB	0%	0 MB/s	0 Mbps	0%	
> IAStorDataSvc (32 bit)		20.4 MB	0%	0 MB/s	0 Mbps	0%	
Application Frame Host		16.4 MB	0%	0 MB/s	0 Mbps	0%	
Usermode Font Driver Host		13.9 MB	0%	0 MB/s	0 Mbps	0%	
> Service Host: Local System (2)		13.8 MB	0%	0 MB/s	0 Mbps	0%	
> Microsoft Windows Search In...		13.1 MB	0%	0 MB/s	0 Mbps	0%	
IAStorIcon (32 bit)		10.9 MB	0%	0 MB/s	0 Mbps	0%	
Usermode Font Driver Host		10.5 MB	0%	0 MB/s	0 Mbps	0%	

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↑ Fewer details End task



Resource sharing



Resource Sharing

- Multitasking is sharing the processor so that several tasks appear to execute simultaneously on a single CPU.
- Resources like memory, files, and printers can be shared.



Managing Memory

- Process shares the available memory on a computer
 - Executable programs written in binary machine code contains instructions and data whose storage locations are indicated by **memory addresses**.
 - **Relocation** scheme allows the computer to load multiple programs in memory
 - In a virtual memory system, system juggles **memory pages** between RAM and disk if there is no sufficient RAM



Relocation

- Executable programs written in binary machine code contains instructions and data whose storage locations are indicated by memory addresses.
- Any memory location that contains an address is specially marked in a binary file.
- When a user runs the program
 - OS allocates memory for it and loads into the allocated memory area.
 - OS updates all the memory references so that they point to the correct locations.



Resource Sharing: Files

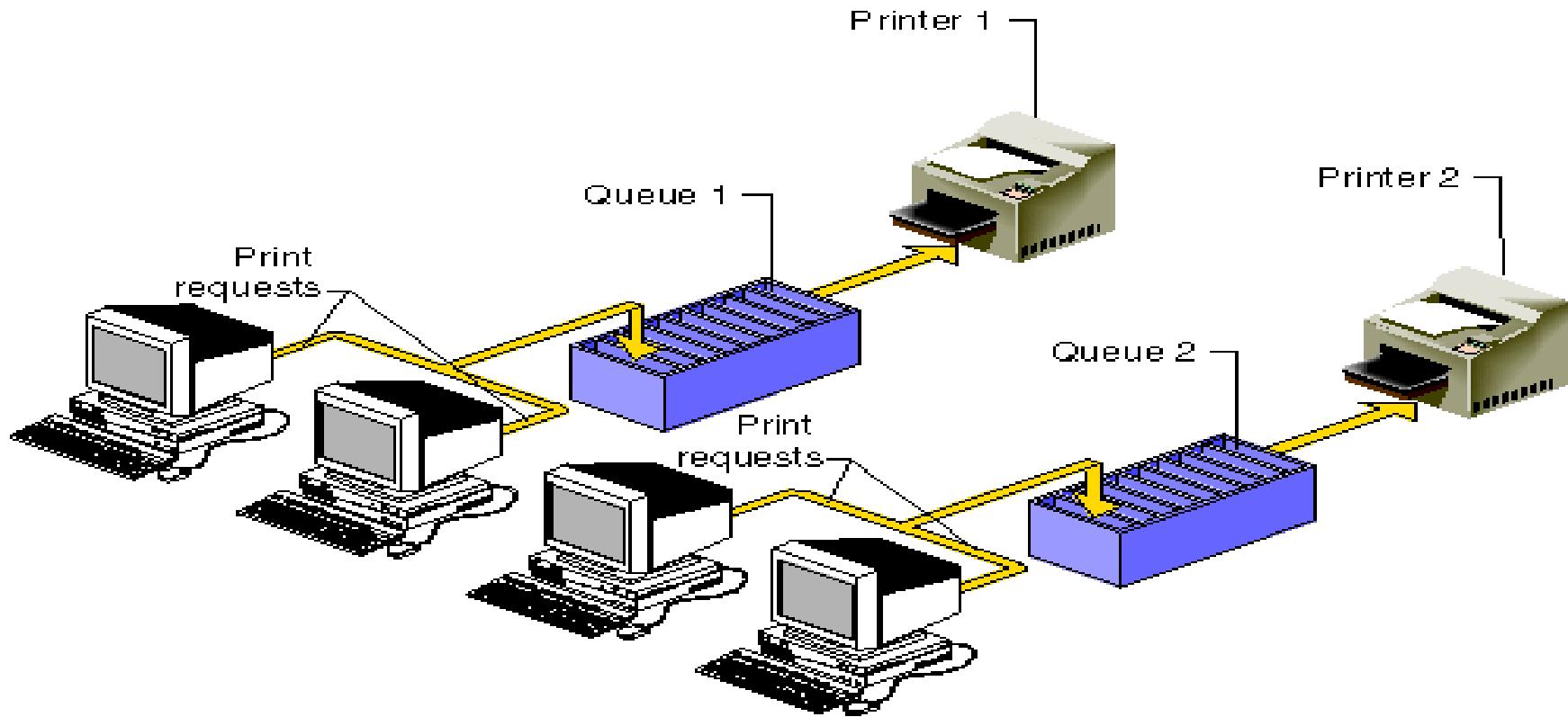
- Files are shared between applications and users in a networking environment.
- OS defines a set of permissions for files to prevent unauthorized access to files.
- Permissions include:
 - **Read access**: allows user to read a file
 - **Write access**: allows user to modify or delete a file
 - **Execute access**: allows user to perform special operations such as viewing the contents of a directory or executing a program



Resource Sharing - Printers

- Can be shared among applications, users, and machines
- Files to be printed are sent to a *print server*, which maintains a list of files to be printed
- Server processes one request for printing at a time
- Print requests are stored on a disk in a process called *spooling*.
- Spooling allows the process issuing the print to continue with other processes.
- If a printer is connected to a network, print requests from other machines on the same network can be processed.

Printer Sharing



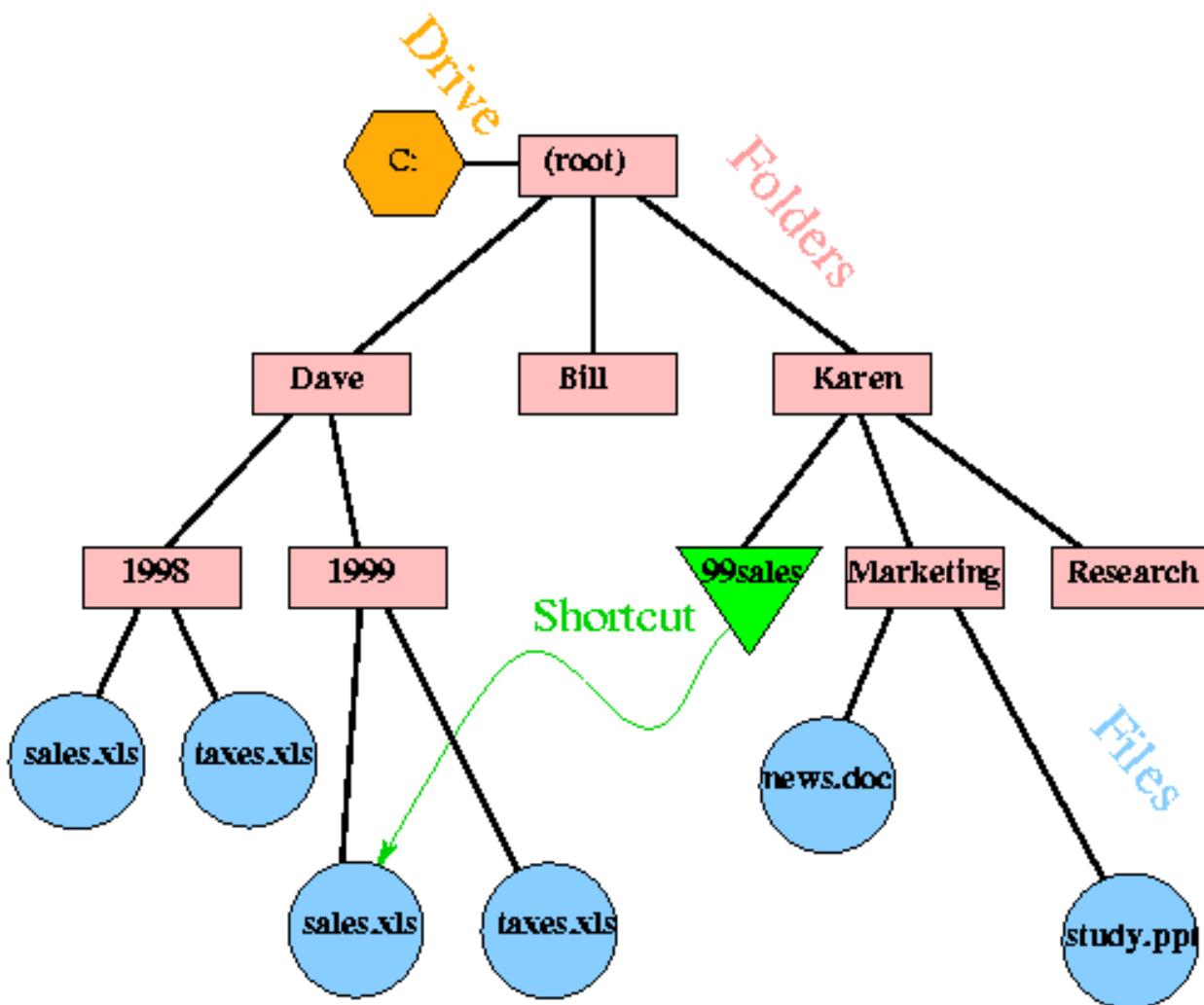


File Systems



File Systems

- A file system defines the structure and the rules used to read, write, and maintain information stored on a disk.
- Which system used is determined by;
 - Hardware
 - Software
 - Security needs
 - Need for a dual-booting system





File Systems

- System that an operating system or program uses to organize and keep track of files.
- A **file** is a named collection of data existing on a storage medium.
- **Filename** is a unique set of letters and numbers that identifies a file and describes the file contents.
- **File extensions** indicate the category to which the file belongs, preceded with a dot.
- The maximum number of characters that a file name can have is different for different operating systems.
- **Wildcards** are used to represent unknown group of characters in the filename and the extension.
 - For example, “newfile*” means all the files whose name begin with “newfile” followed by whatever characters in the file name including extensions.
 - ?



File Systems (continued)

- Files can be of two types
 - An **executable file** containing program instructions that tell a computer how to perform a specific task.
 - **Data file** containing words, numbers, or pictures that can be viewed, edited, saved, sent, or printed.
- Filename extensions fall into 2 categories:
 - **Generic filename extension**: indicates the general type of data contained in a file, which can be opened with several software packages (e.g. .txt)
 - **Application-specific filename extension**: associated with specific application software and the application used to create the file (e.g. .doc, .ppt)
- Other type of files are essential for software and hardware operations (e.g. .bat, .sys, .cfg, .dll).



File Organization

- **File manager** utility software helps us locate, rename, move, copy, and delete files (e.g. Internet Explorer).
- **Device Letters** are identifications for storage devices such as the floppy disk drive, the hard disk drive, and CD-ROM or DVD drives.
- Operating system maintains list of all the files in a “directory” for each disk.
- A **directory** contains all the information about the file including the filename, filename extension, date and time the file was created, and the file size.
- **Main directory**: root directory that contains useful list of all the files within the directory.



Folders

- Folder gives the file system a **hierarchical structure**, like a family tree.
- The file system will not permit two items in a folder to have the same name.
- Folder names usually do not have a file extension

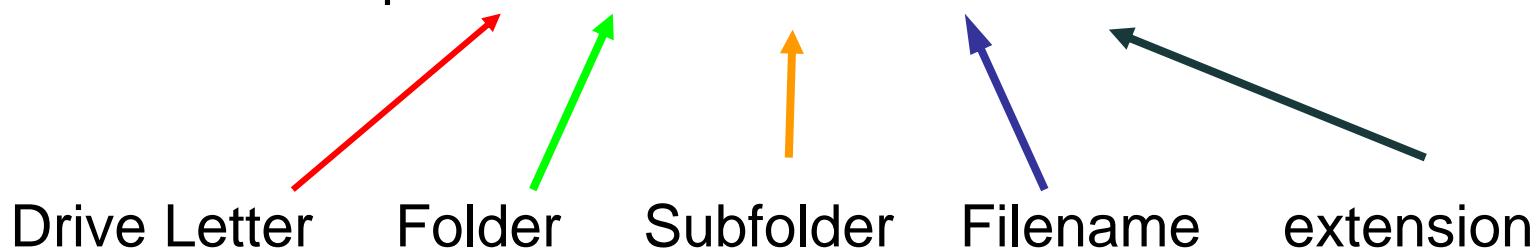


Drives

- Folders are housed in the computer drive.
- A computer can have many drives, drive A, drive C, drive D, drive E, etc.
- One way to access the drives is by double-clicking on the icon named "My Computer" on your Desktop.
- Operating system maintains list of all the files in a "directory" for each disk.

Path

- File specification, also called a path, includes the drive letter, folder, Filename and an Extension that identifies a file.
 - For example: C:\Ssd2\Text\demo.doc.



- Names of folders are differentiated from drive letters and files separated by the backslash symbol “\” (Dos & Windows).

File Names and Types

.txt	Plain text file	.doc	Microsoft Word document
.htm	HTML (Hypertext Markup Language) document	.xls	Microsoft Excel spreadsheet
.gif	GIF image (Graphic Interchange Format)	.jpg	JPEG image (Joint Photographic Experts Group)
.wav	Sound file	.exe	Executable file (binary machine code)
.com	MS-DOS executable ("command" file)	.drv	Driver (for a peripheral device)
.bat	Batch (script) file for the DOS command interpreter		



End of Unit 3

Word Processing

What we'll cover for this lecture topic:

- Types and Examples of Application software
- Creating Documents with Word
- What is logical and physical document structure?
- Demos (as much as time permits)
 - *Including some useful hints and strategies*



The Microsoft Office Suite

BASIC SUITE

- Word processor (Word)
- Spreadsheet (Excel)
- Email utility (Outlook)
- Web browser (Internet Explorer)

PROFESSIONAL SUITE

Also includes:

- Presentation maker (PowerPoint)
- Desktop Web publisher (Front Page)
- Database (Access)

Content Covered in this Module

- What is Microsoft Word
- Starting Microsoft Word
- Ribbon Menu System
- “File” Menu
- “Home” Ribbon Menu
- “Insert” Ribbon Menu
- “Page Layout” Ribbon Menu
- “References” Ribbon Menu
- “Mailings” Ribbon Menu
- “Review” Ribbon Menu
- “View” Ribbon Menu
- Primary Tasks
- Creating a New Document
- Opening an Existing Document
- Opening Multiple Documents
- Saving a Document for the First Time
- Saving a Document
- Working With Text
- Formatting - Margins
- Formatting - Headers and Footers
- Formatting - Page Numbers
- Non-Text Items – Bullets
- Non-Text Items – Tables
- Non-Text Items – Images
- Non-Text Items – Hyperlinks
- Proofing Tools – Spellcheck
- Printing Options
- Closing Documents

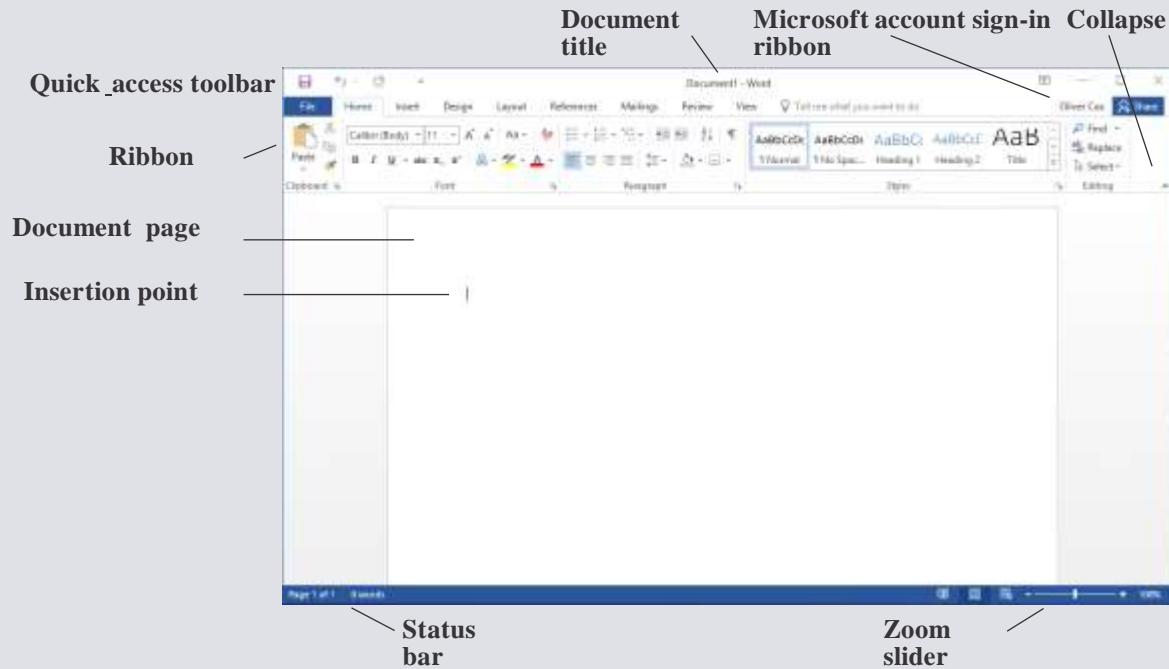
What is Microsoft Word 2016?

SOFTWARE ORIENTATION

Microsoft Word's Primary User Interface

Before you begin working in Microsoft Word 2016, you need to acquaint yourself with the primary user interface (UI). When you open a blank document in Microsoft Word 2016, you see a screen similar to that shown in Figure 1-1.

Figure 1-1
Microsoft Word 2016
Opening screen



Microsoft has designed the Word UI to provide easy access to the commands you need most often when creating and editing documents.

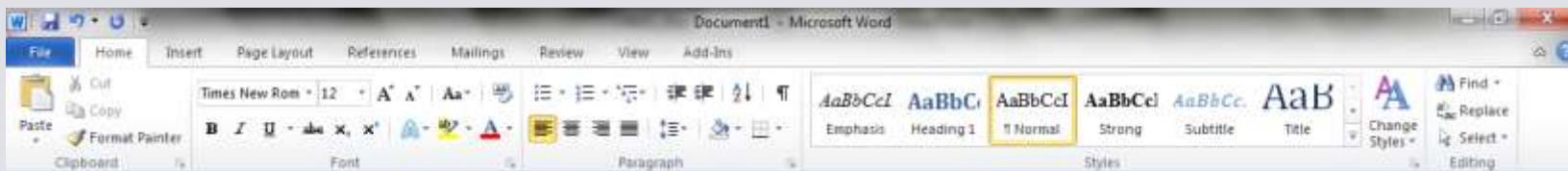
Starting Microsoft Word

You may start Microsoft Word by locating the Microsoft Office shortcut folder, and selecting the Microsoft Word shortcut.

On Windows 10

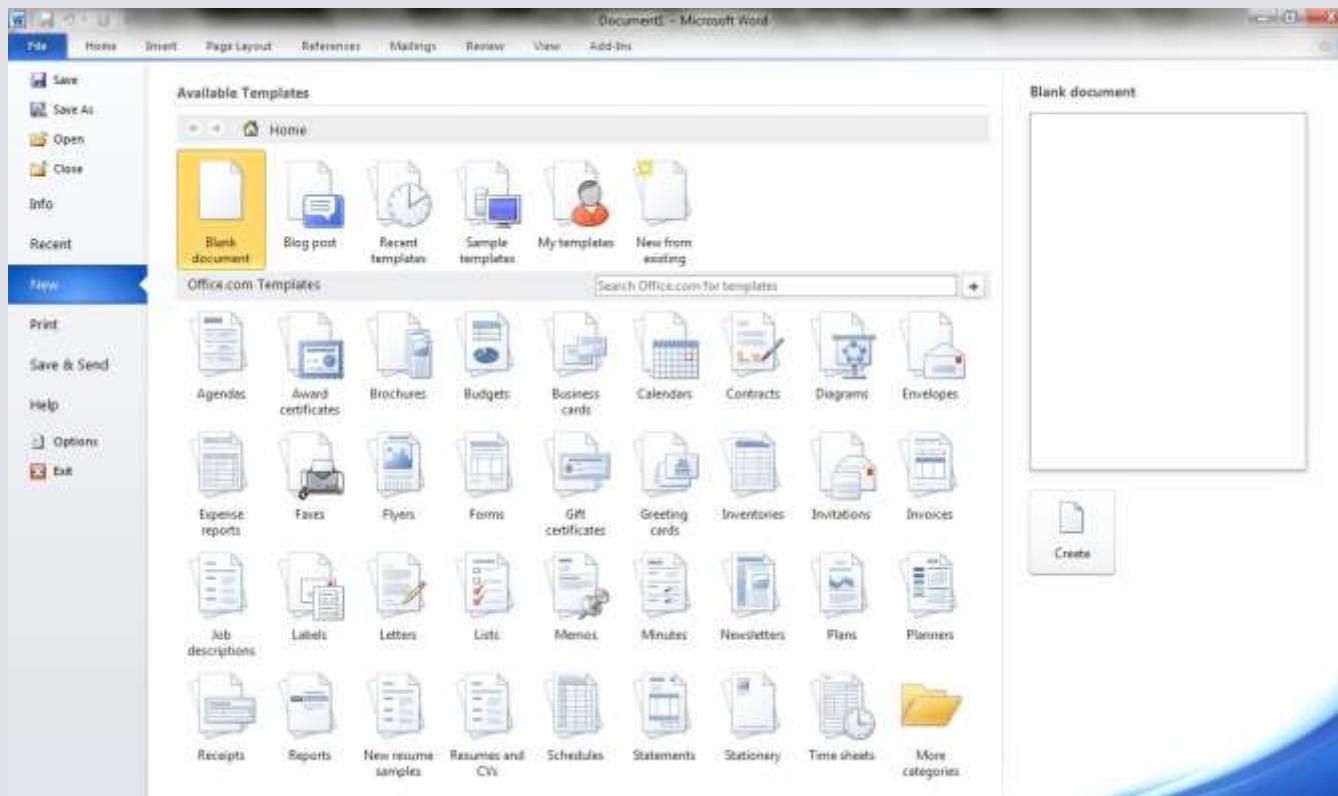


Ribbon Menu System



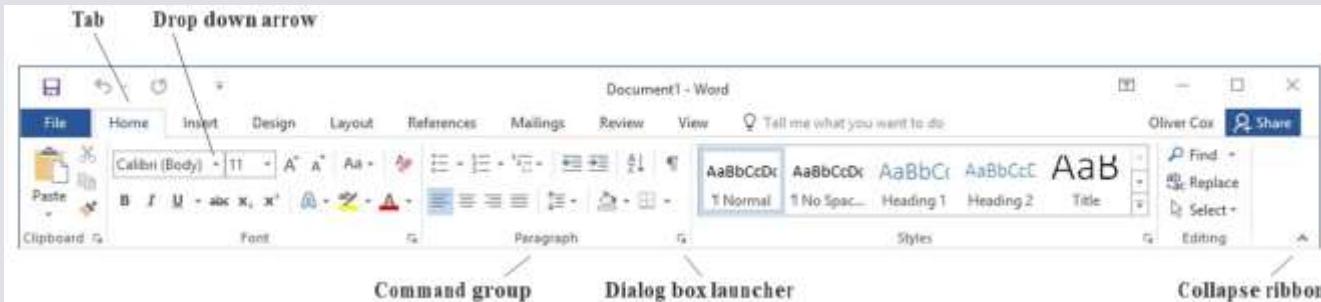
- The current versions of Microsoft Word use what is referred to as the “ribbon menu” system.
- The ribbon menus differ from the previous style menus in that the number of possible selections is far smaller, and the menus are not dropdown menus. Rather, the menus are selectable menus that do not disappear once you move your mouse to another part of the screen.
- The “File” menu is the only remaining dropdown menu among the primary menus.
- The menu tabs will allow you to navigate Microsoft Word features, and perform various functions.
- The different menu tabs typically contain similar sets of features.

“File” Menu

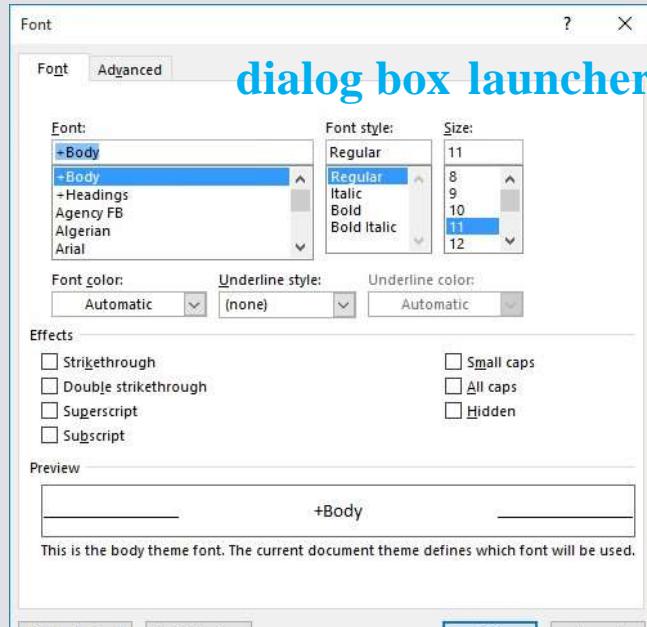


- This menu will give you access to general options related to the Word file itself.

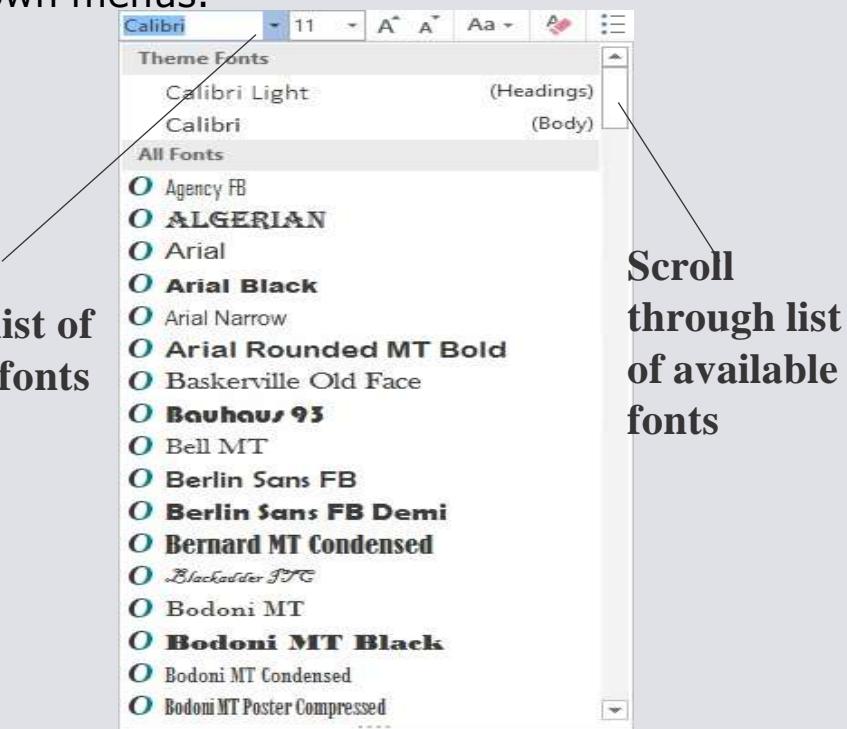
“Home” Ribbon Menu



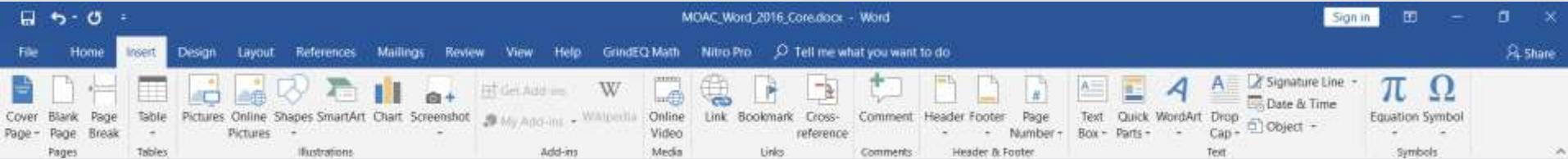
- The “Home” menu contains general options such as font sizes, alignment, copy/paste.
- The bulk of your time in the menu system will be spent in this menu.
- The font size and style controls are located within this ribbon, as shown below. You may adjust these settings by using the relevant dropdown menus.



Displays list of available fonts

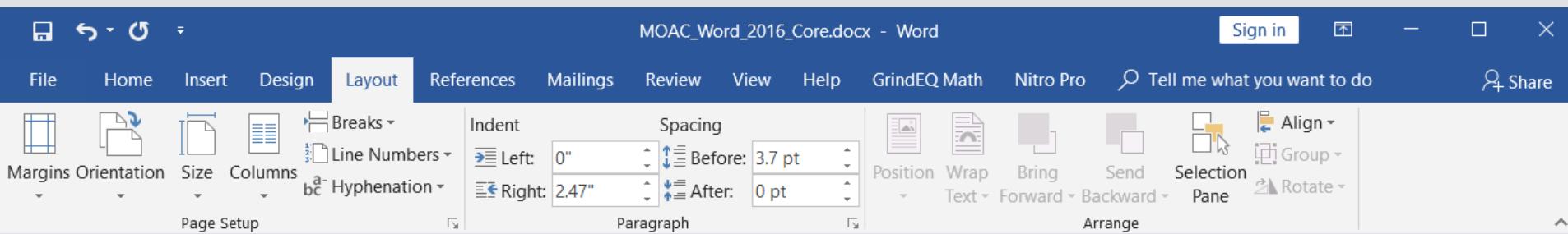


“Insert” Ribbon Menu



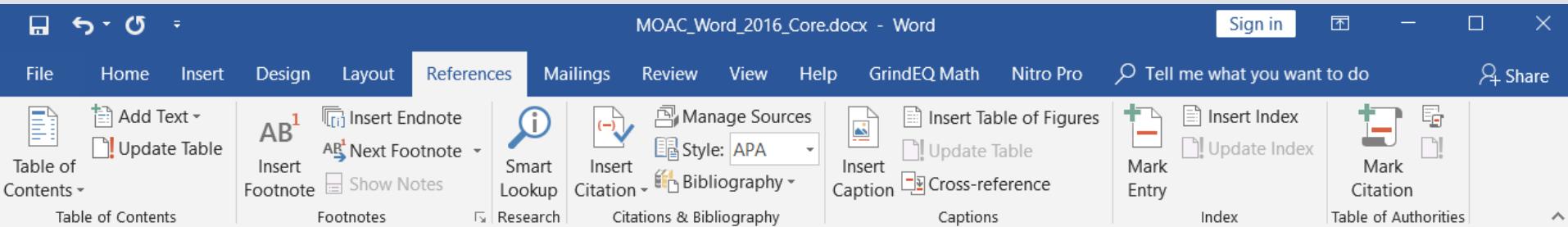
- This menu allows you to insert a variety of non-text objects into your document. You can use it to add tables, pictures, links, headers and footers, among other things.

“Page Layout” Ribbon Menu



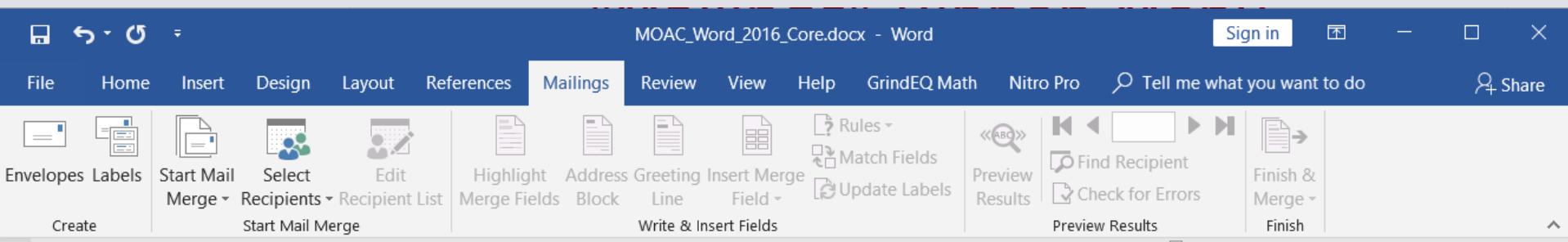
- The “Page Layout” menu is where you will do the majority of your document formatting. You can use it to set margins, page orientation, size, the number of text columns, borders, indentation and spacing.

“References” Ribbon Menu



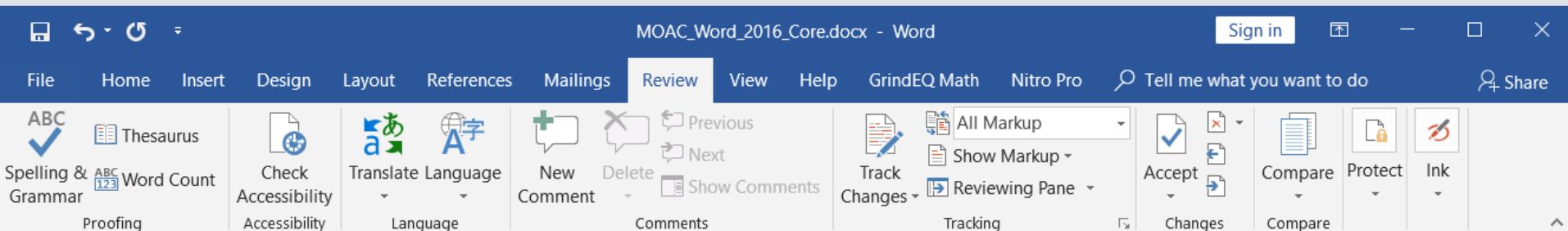
- The “References” menu allows you to easily cite and reference sources that you may use while creating a document.

“Mailings” Ribbon Menu



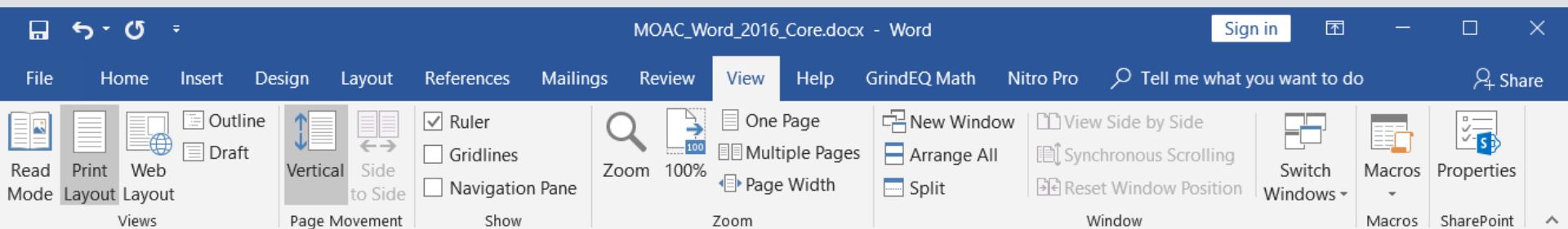
- The “Mailings” ribbon menu contains a number of features related to documents that will be created for the purpose of being sent in the mail.
- You can use these tools to print envelopes and labels, as well as personalizing individual letters in a large mailing to the specific recipient using address and contact information.
- Note that not all printers support these features, and you must have contacts available in your Microsoft Outlook application in order to use the “Select from Outlook Contacts” feature.

“Review” Ribbon Menu



- The “Review” menu allows you to review your document for spelling and grammatical errors, insert comments, track (and accept) changes made to your document during reviewing, and compare or combine two documents.

“View” Ribbon Menu



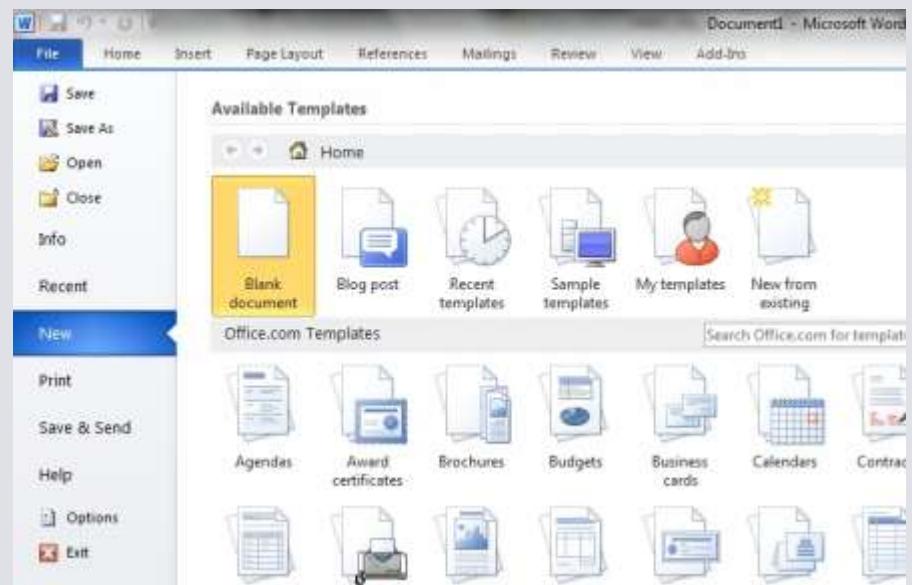
- The “View” menu allows you to change how the document is viewed within Word.
- The “Zoom” and the “Document Views” sections of this document are where you will spend the majority of the time in this menu.

Primary Tasks

- Aside from actually typing the document, there are a number of tasks that you will perform most during your usage of Word. These tasks include:
 - Creating new documents
 - Opening existing documents
 - Saving documents
 - Working with text within documents
 - Formatting documents
 - Inserting non-text items
 - Proofing documents
 - Printing documents
 - Closing Documents

Creating a New Document

- Upon starting Microsoft Word, a new blank document will be created.
- Alternatively, a new document may be created by selecting the “File” dropdown menu located at the top of the main Word window, and selecting “New”. You must then select the type of new document you would like to create.
- Don’t forget to save and rename your document from the default name after creating it.
- Alternatively, the keyboard shortcut CTRL + “N” may be used.



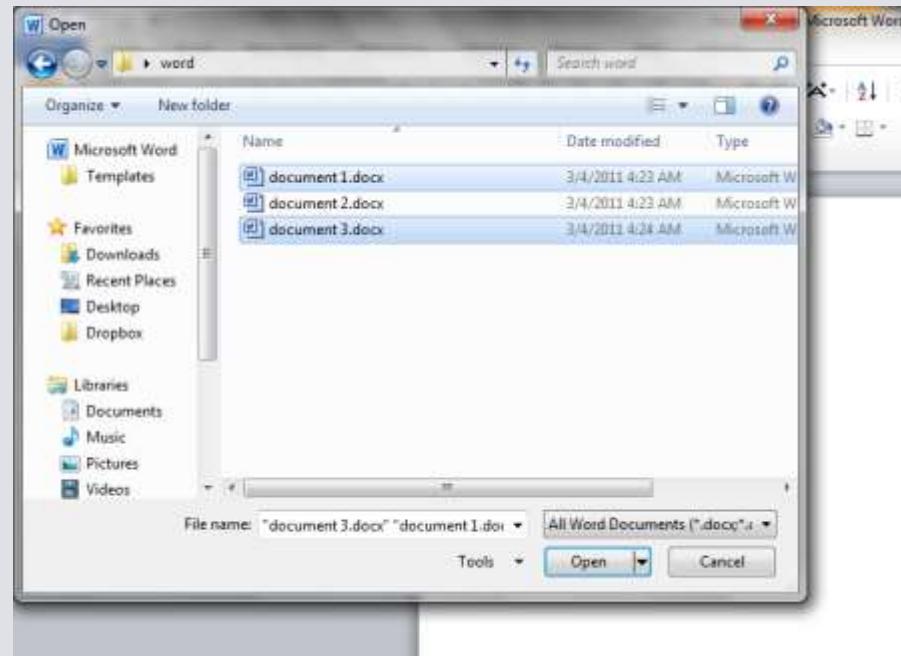
Opening an Existing Document

- To open an existing document, first locate and select the “File” menu and select “Open”.
- In the dialog box that appears, browse to your file and press the button labeled “Open” located at the lower right corner of this box.
- Alternatively, the keyboard shortcut CTRL + “O” may be used.



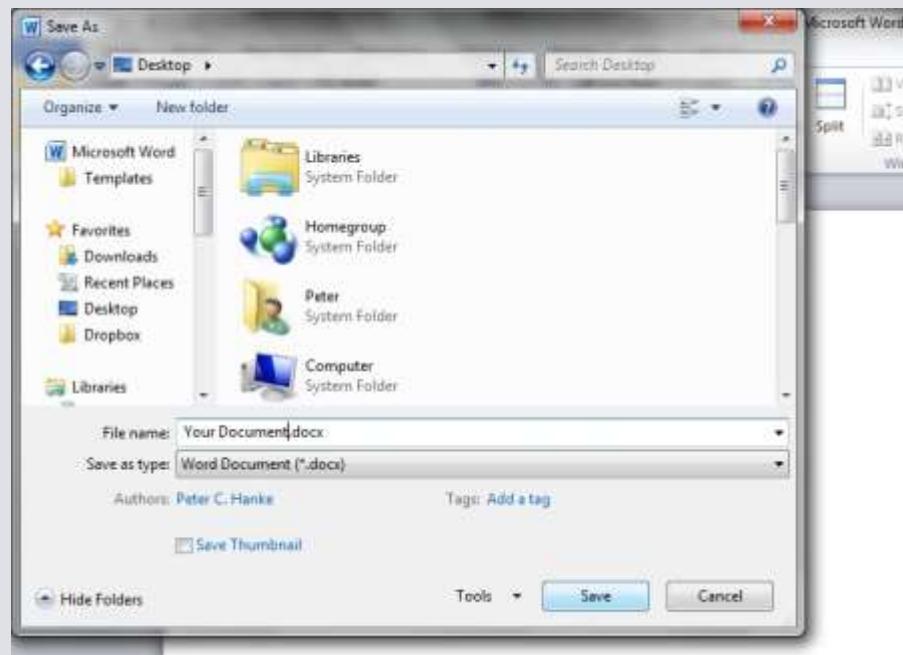
Opening Multiple Documents

- Opening multiple documents is very similar to opening a single document.
- First, locate and select the “File” menu and select “Open”.
- In the dialog box that appears, browse to the location of your files.
- The keyboard shortcut CTRL + “O” may be used to access the “Open” dialog box.
- To select multiple files, hold the “CTRL” key and click on each of the files you want to open.
- Alternatively, you can hold the “Shift” key and then use the arrow keys to select multiple consecutive documents in a row.
- Once you have selected the desired documents, press the “Open” button.



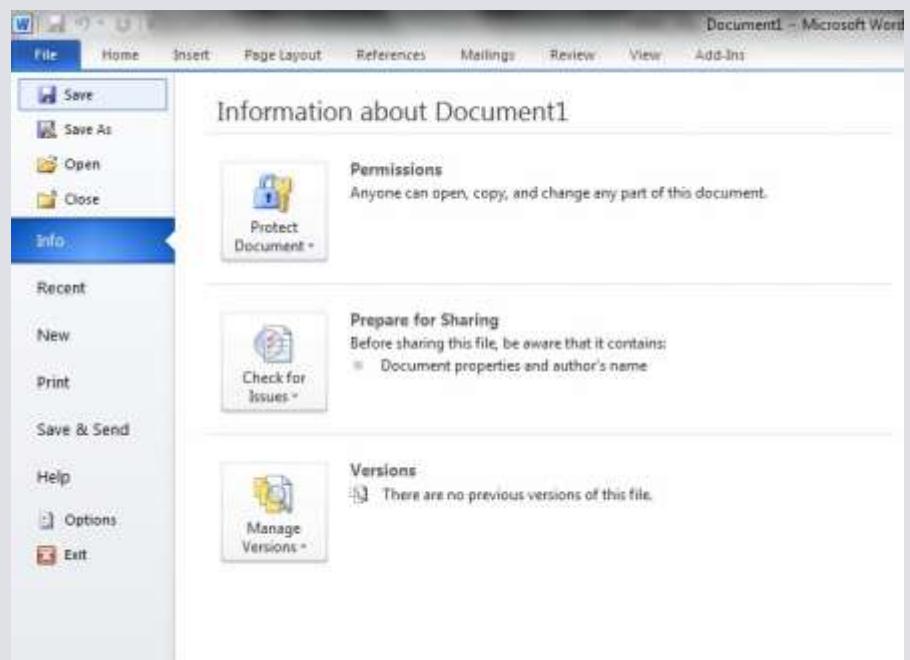
Saving a Document for the First Time

- If you are saving a document for the first time, you should specify a file name and the location to which the file will be saved.
- To save a document for the first time, select the “File” dropdown menu, and select “Save as”.
- The “Save as” window will appear, at which point you should locate and select the location that you want the file to be saved to, as well as naming the file what you would like it to be called.



Saving a Document

- To simply save a document without renaming or relocating it, locate and select the “File” menu.
- Select the “Save” option.
- Alternatively, the keyboard shortcut CTRL + S may be used.

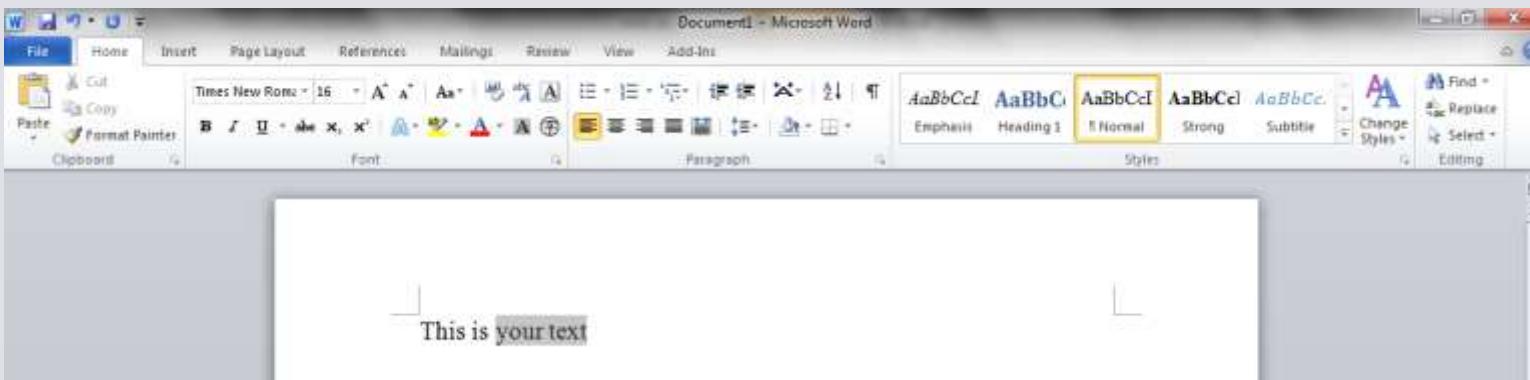




Saving a Word Document

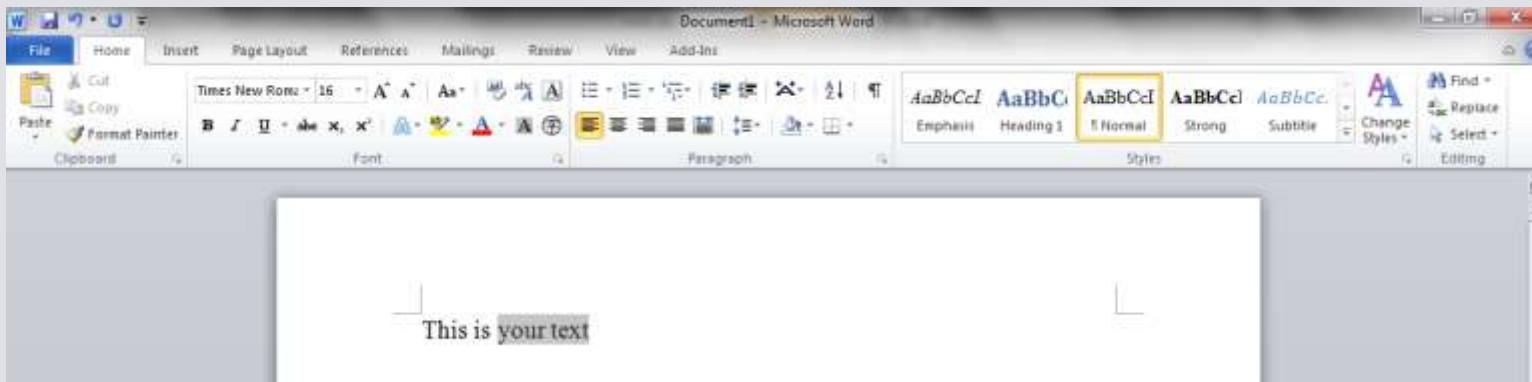
- ◆ Word allows a user to save files in the following four XML based formats:
 - ◆ **.docx** – ordinary document containing no macros
 - ◆ **.docm** – document containing macros or is macro enabled
 - ◆ **.dotx** – template that does not contain macros
 - ◆ **.dotm** – template that can store macros

Working With Text



- In addition to simply typing words into a document, you can highlight, select, copy, cut, and paste items using either standard Windows shortcut methods, or buttons in Word.
- To select a block of text, click and hold the left mouse button at the beginning portion of the block you wish to select, and then drag the mouse over the desired text. You will notice that the text will be highlighted as you do this.
- Once you have the desired text selected, release the mouse button.
- Note that while clicking on another part of the document while you have text selected will deselect it.

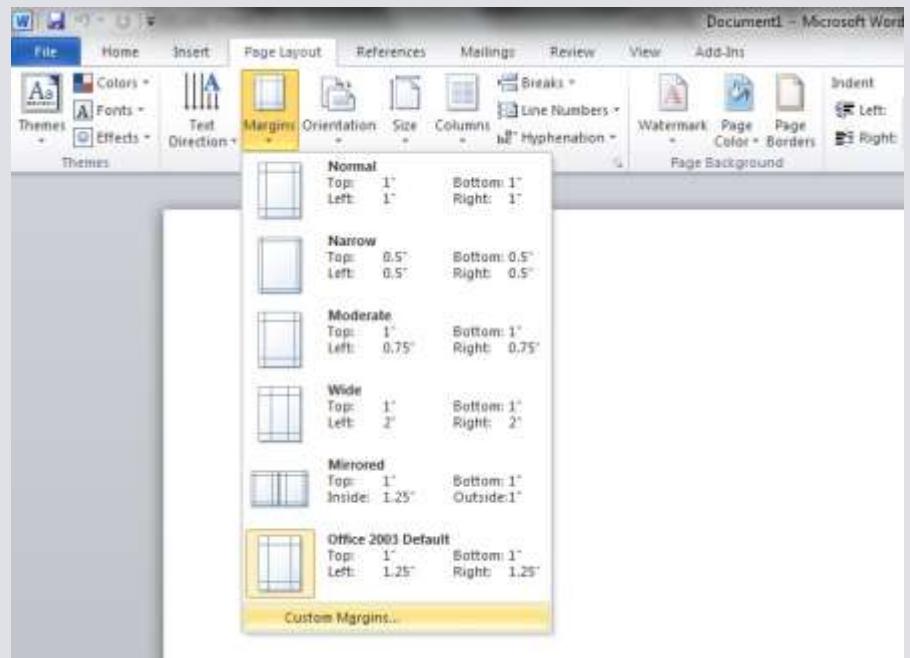
Working With Text (cont.)



- Once you have the desired content selected, you can cut, or copy it to use it in another location.
- To cut the selected content, locate and select the “cut” button in the “Clipboard” portion of the “Home” ribbon menu. This will remove the selected content from its current location and allow you to use it elsewhere. (keyboard shortcut: “CTRL” + “X”)
- To copy the selected content, locate and select the “Copy” button in the “Clipboard” portion of the “Home” ribbon menu. This will copy the selected content, allowing you to use it elsewhere without removing it from the document. (keyboard shortcut: “CTRL” + “C”)
- To paste the text, locate and select the area of the document in which you would like to paste, then locate and select “Paste” button located in the clipboard portion of the “Home” Ribbon Menu. (keyboard shortcut: “CTRL” + “V”)

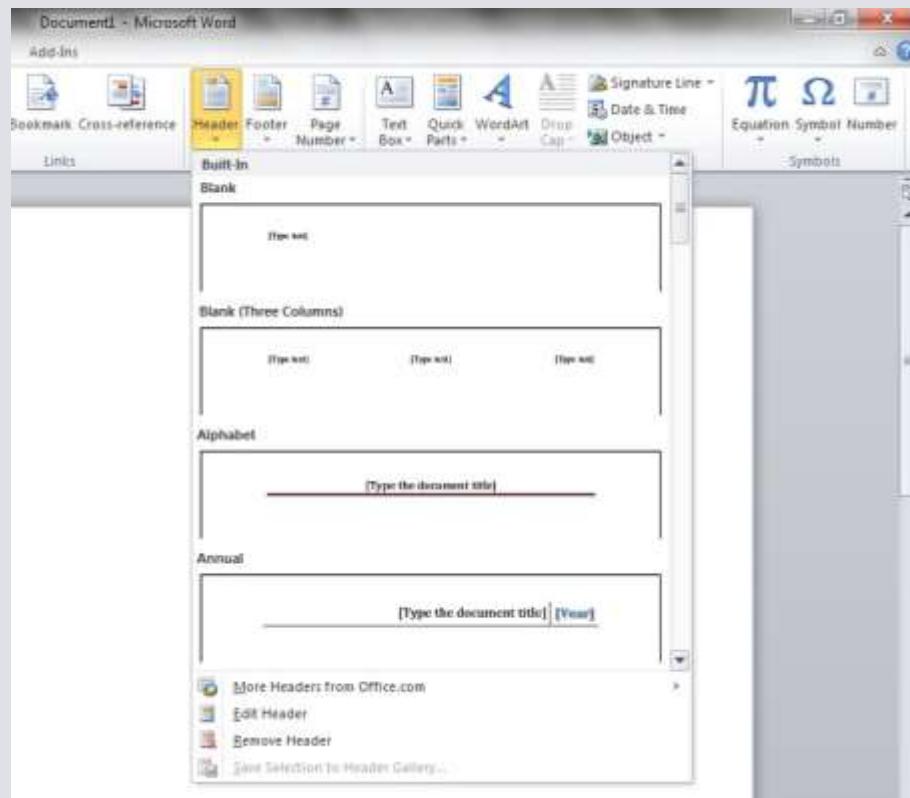
Formatting - Margins

- To set margins, locate and select the “Page Layout” menu.
- Select the “Margins” button.
- A number of preset margin settings will drop down in a menu. You can select one of those, or select “Custom Margins” at the bottom of this menu to specify your own.
- A dialog box will appear. The basic margin settings are located at the top of this box.
- Also note the “Orientation” portion of this menu.



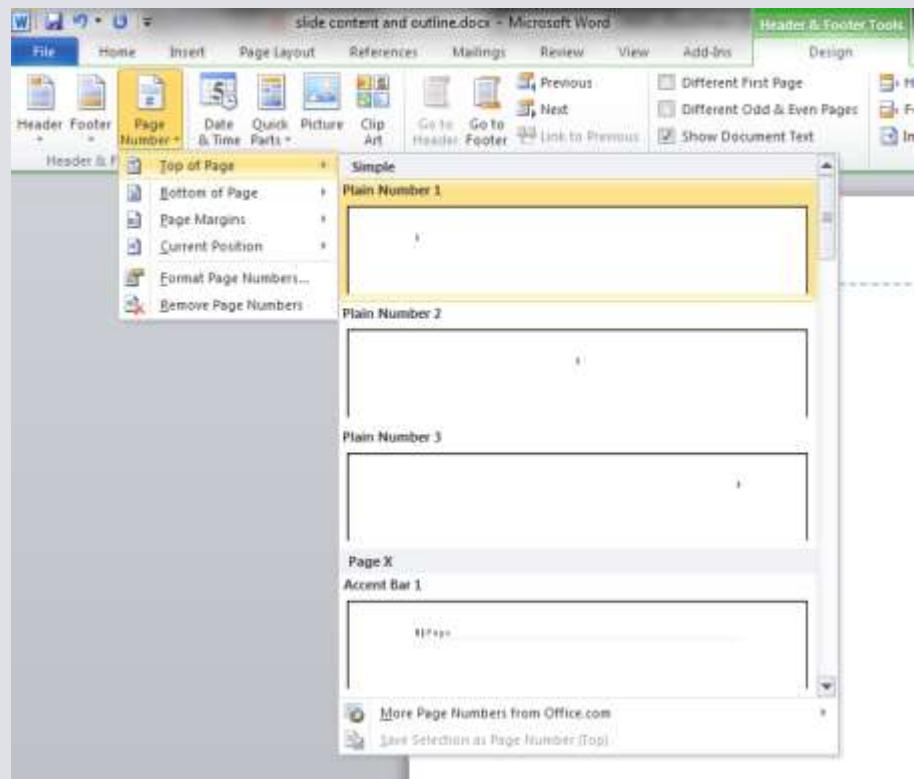
Formatting – Headers and Footers

- Options for headers and footers will be located in the “Insert” ribbon menu in the “Header & Footer” section.
- To add a header, or footer, press the “Header”, or “footer” button.
- A dialog box will appear which will allow you to specify the type of header that you would like to add.
- To just add a simple header, select the “Blank” header.
- To navigate to or away from the header, just double-click on the area of the document that you would like to move to.



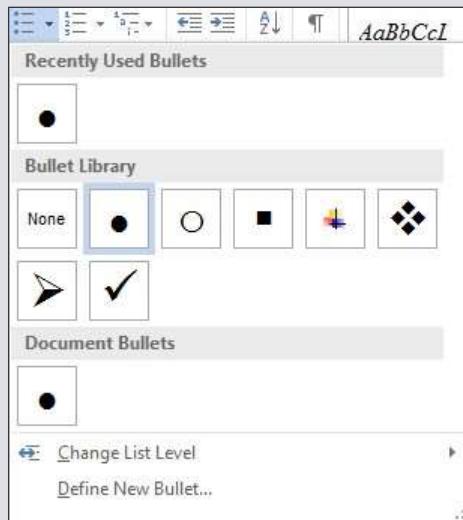
Formatting – Page Numbers

- Page numbers are a very commonly used header element.
- To add page numbers to your header or footer, first create and select a header or footer.
- After you have created a header or footer, locate and select the “Page Number” button located in the “header and footer” portion of the “insert” ribbon menu.
- In the dropdown menus that appears, select the location in which you want to place your page numbers.



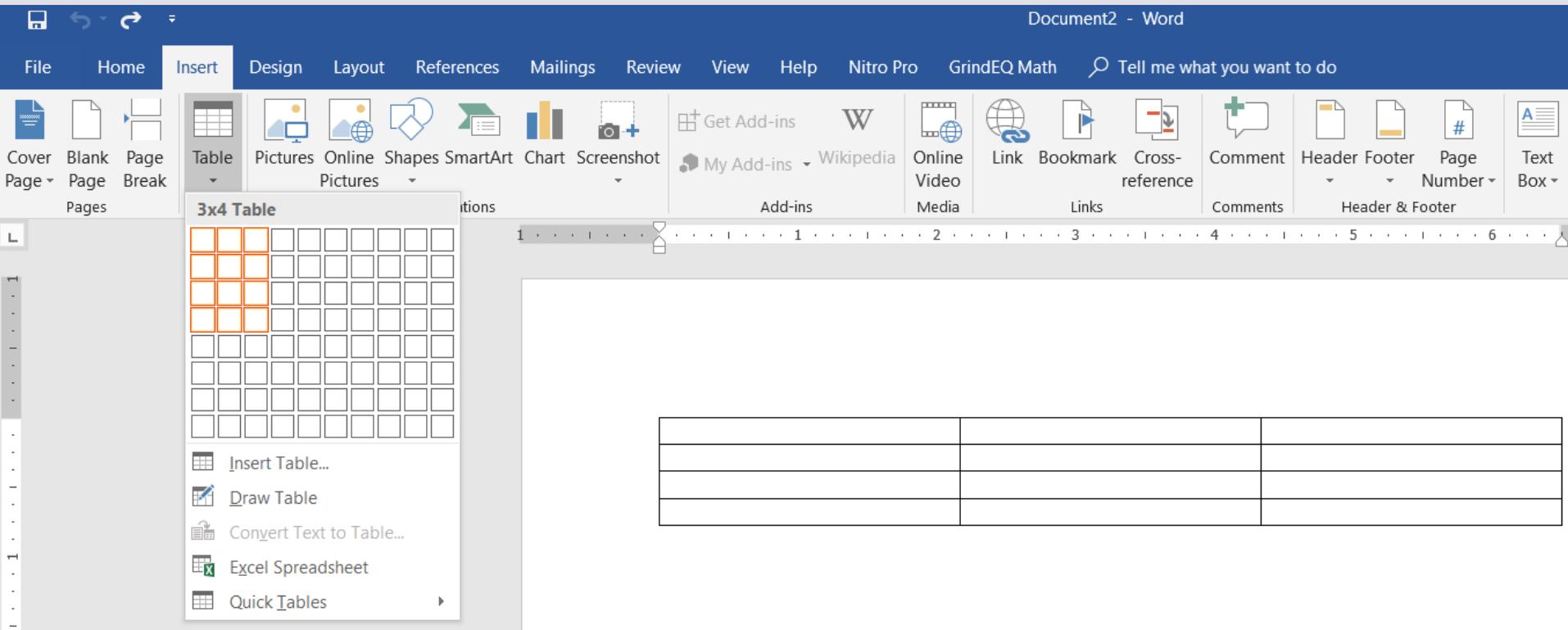
Non-Text Items - Bullets

Bullet formatting options



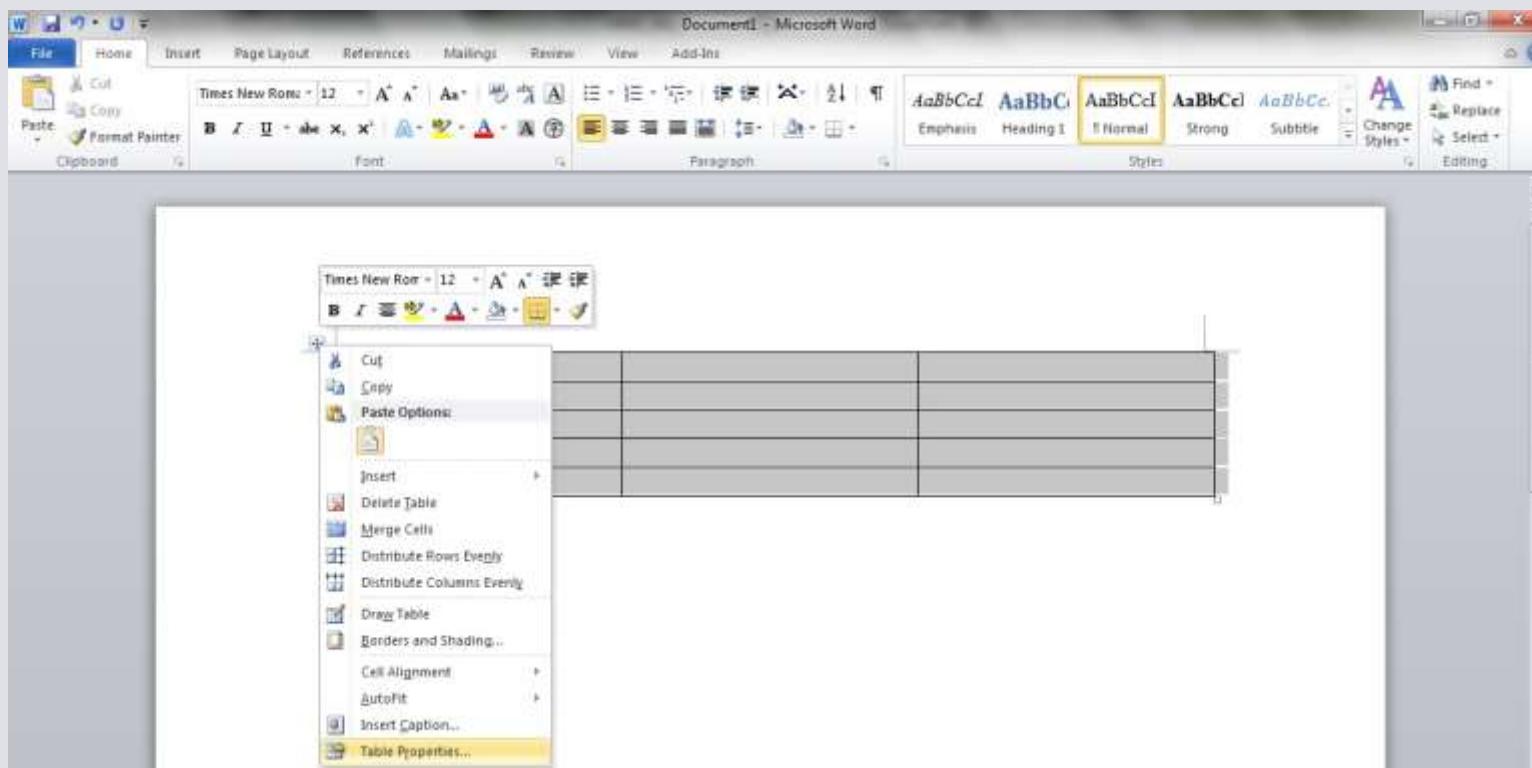
- To use bulleted lists, find and select the “Home” menu.
- Select the bullet button located the “paragraph” section of this menu to start the list.
- To create the next bullet in the list, press “enter”.

Non-Text Items - Tables



- To insert spreadsheet-like tables, first select the “Insert” menu.
- Find and select the “Table” button located in the “Tables” section of this menu.
- In the menu that appears, use the table graphic to select the size of the desired table by clicking on the graphic in the appropriate location.

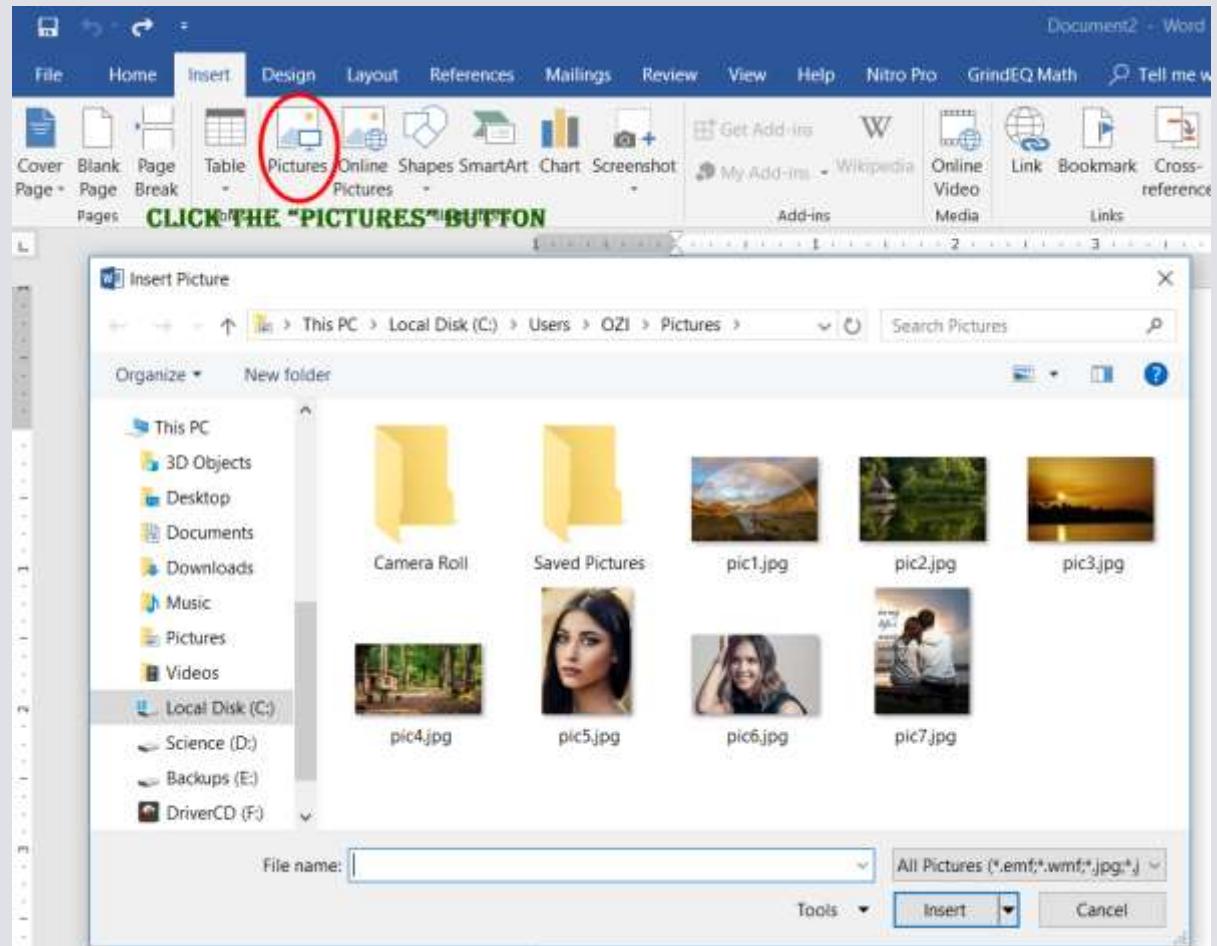
Non-Text Items – Tables (cont.)



- Once you place a table and are ready to format it, select the table and right click on the icon in the upper left corner of the table. A contextual menu will appear.
- The most notable selections in this menu are “Table Properties”, “Insert”, and “Delete Cells”.

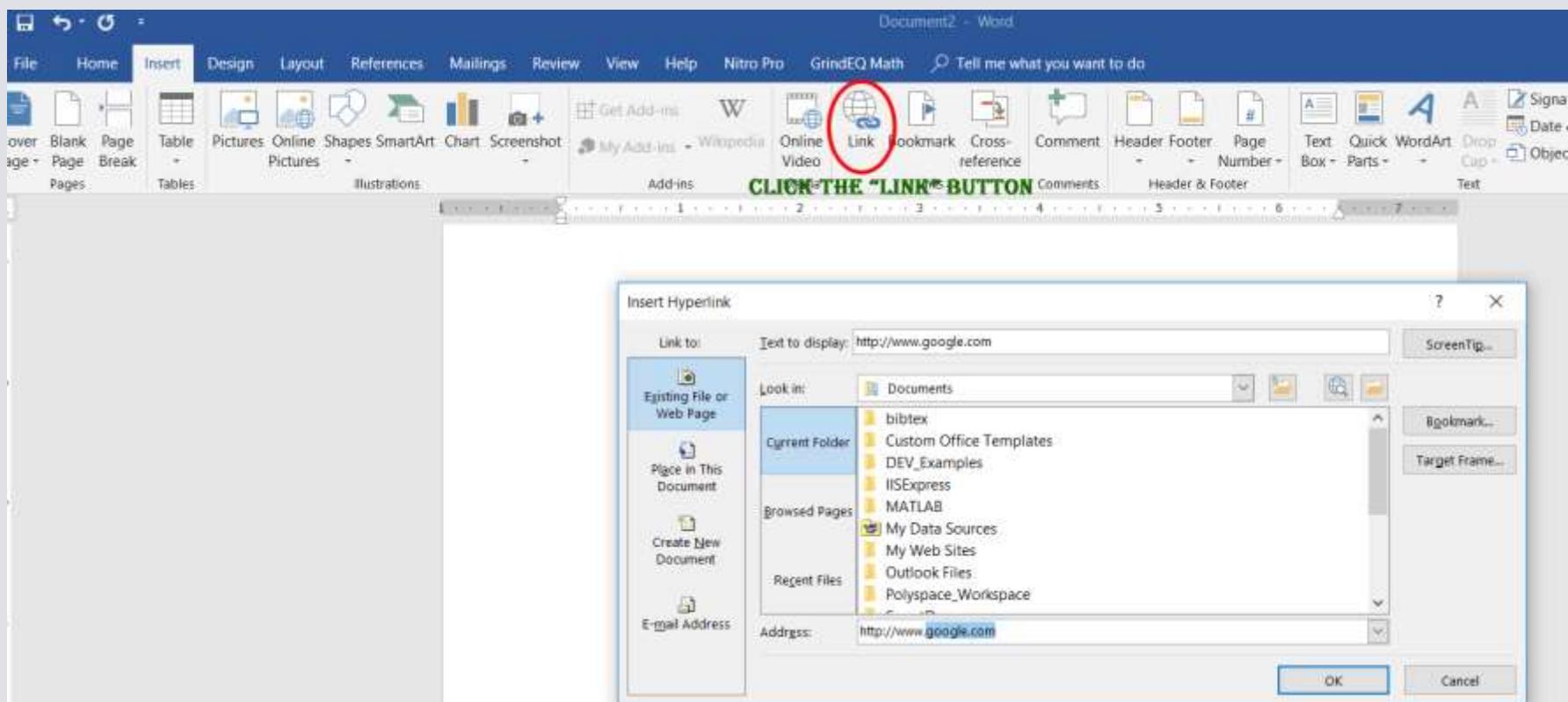
Non-Text Items - Images

- To insert an image into your document, first select the “Insert” menu.
- Locate and press the “Picture” button in the “Illustrations” section.
- In the Dialog box that appears, browse to the photo you wish to insert and press the “Insert” button.



Non-Text Items - Hyperlinks

- To insert a hyperlink into your document, select the “Insert” menu.
- Locate and select the “Links” button.
- In the dropdown menu that appears, select the “Hyperlink” button.
- You can either browse to a location using the “Look in:” section of this window, or you can type an address manually in the “Address:” bar at the bottom.
- The name of the link as it appears in your document will be determined by what is entered in the “Text to display” field located at the top of the dialog box.
- When you are done, press the “Ok” button located at the bottom of the screen



Proofing Tools - Spellcheck

- To check your document for spelling errors, use the spell and grammar check feature.
- Select the “Review” menu.
- Select the “Spelling & Grammar” button in the “Proofing” section of the menu.
- Alternatively, press F7 to initiate the check.

Document2 - Word

File Home Insert Design Layout References Mailings Review View Help Nitro Pro GrindEQ Math Tell me what you want to do

ABC ABC 123 Check Accessibility Translate Language New Comment Delete Previous Next Show Comments Track Changes All Markup Show Markup Reviewing Pane

Spelling & Thesaurus Word Count Proofing Accessibility Language

Comments

Tracking

Accept Reject Previous Next

Compare Compare Changes Compare Protect

Block Authors Restrict

Spelling & Grammar (F7)

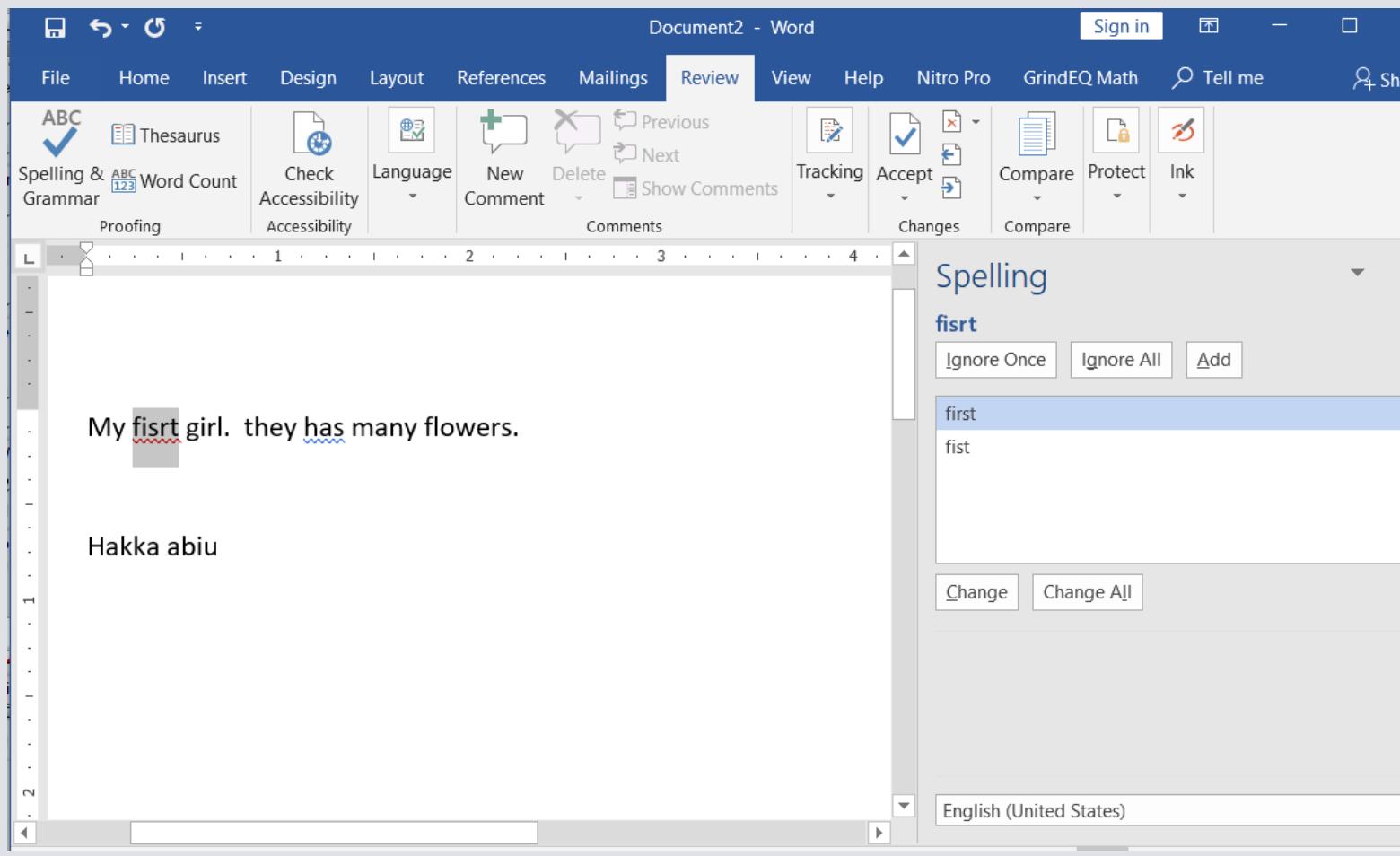
Typos? Not on our watch. Let us check your spelling and grammar.

My fisrt girl. they has many flowers.

Hakka abiu

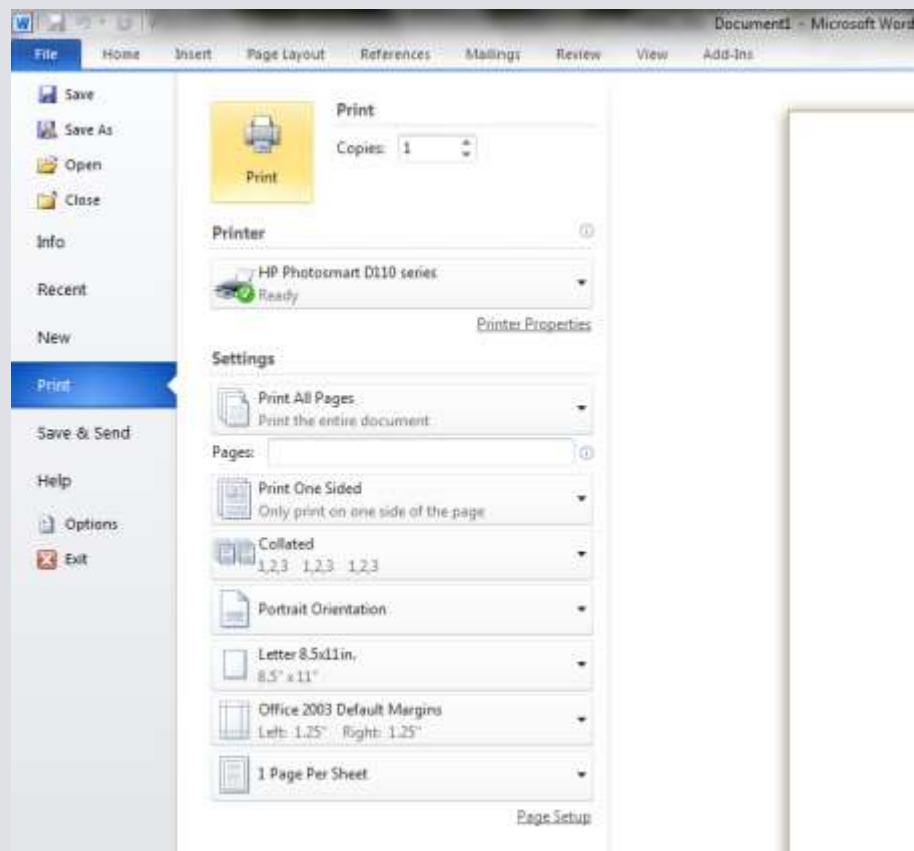
Proofing Tools – Spellcheck (cont.)

- In the “Spelling and Grammar” check dialog box, you can enter corrections manually in the top text field.
- Alternatively, you can select from a list of “suggestions” located in the lower half of the dialog box. Make your desired selection and press the “Change” button.



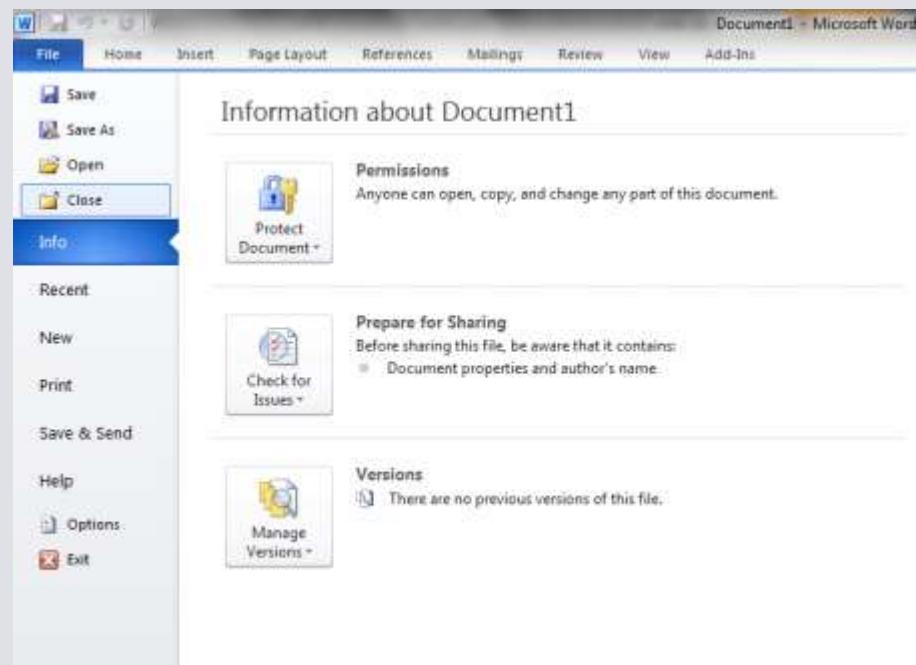
Print Options

- You will find the options related to printing by selecting the “File” menu, and selecting the “Print” option. The Word window will then be populated with options related to printing.
- The most important options are located at the top of the window.
- Make sure that you have the desired printer, and the desired number of copies to print selected.
- When you are ready to print, press the “Print” button located in the upper portion of the screen.



Closing Documents

- To close a document without exiting Word, find and select the “Close” button in the “File” dropdown menu. This will close the document without closing that instance of Microsoft Word
- To close the document and the Word program, you can select the “X” in the upper right hand corner of the window, just like any other application in Windows. (keyboard shortcut: “ALT” + “F4”)



Questions



Introduction to Microsoft Excel

Objectives:

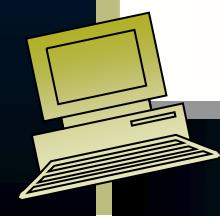
- To define spreadsheets and explain basic functionality
- To introduce the basic features of Excel
 - Vocabulary
 - Entering Data
 - Formatting Data
 - Precision vs. Display
 - Operators & Order of Precedence



Spreadsheet: Electronic sheet of paper organized by columns & rows

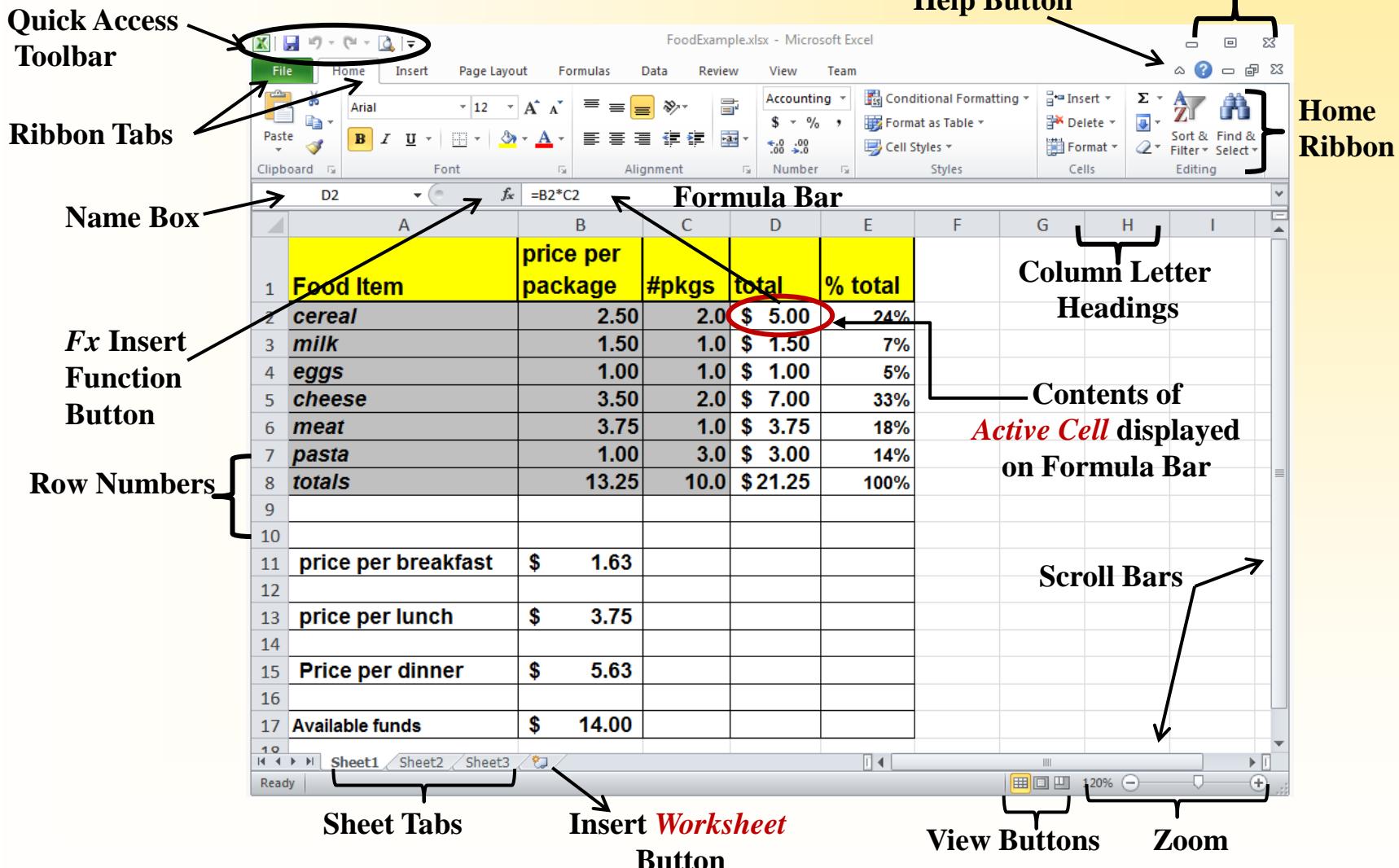
The advantage of an electronic spreadsheet is it allows you to easily change data and have all “related” calculations automatically update..

	A	B	C	D	E
1	Food Item	price per package	#pkgs	total	% total
2	cereal	2.50	2.0	\$ 5.00	24%
3	milk	1.50	1.0	\$ 1.50	7%
4	eggs	1.00	1.0	\$ 1.00	5%
5	cheese	3.50	2.0	\$ 7.00	33%
6	meat	3.75	1.0	\$ 3.75	18%
7	pasta	1.00	3.0	\$ 3.00	14%
8	totals	13.25	10.0	\$21.25	100%



Spreadsheets in Excel are referred to as *worksheets*.

A *workbook* file may contain **many worksheets.**



Each box is referred to as a “*cell*”. Cells may contain *Labels, Values or Formulas* that result in a value or label. A cell is identified first by its column letter and then by its row number

Rows →

Labels →

Columns →

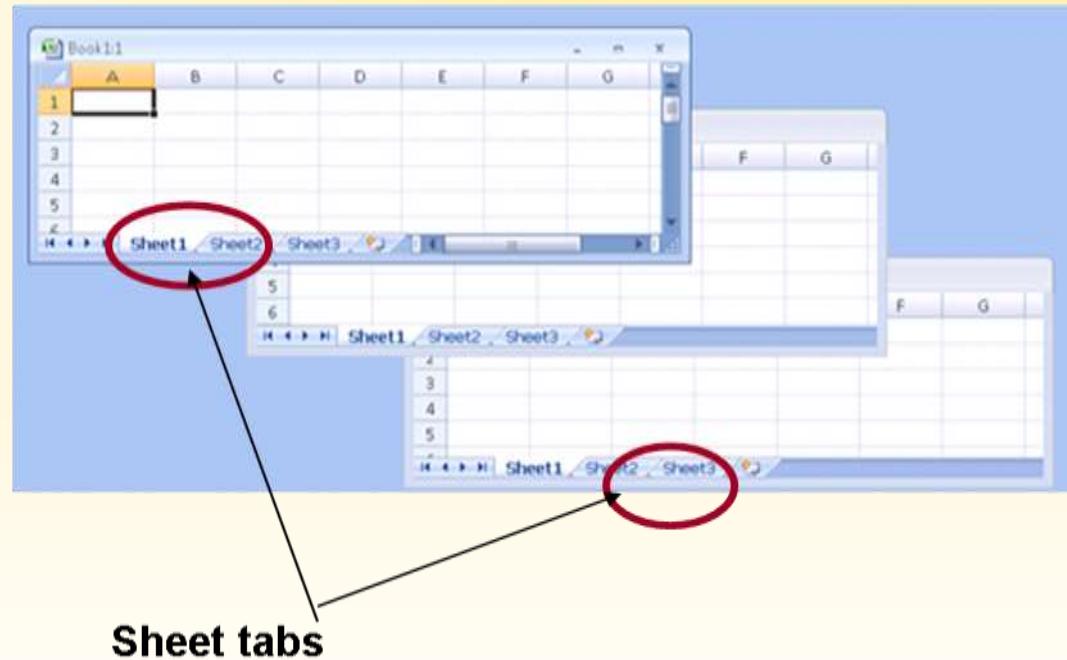
Cell D2 Contains the Formula = B2*C2

	A	B	C	D
1	Food Item	price per package	#pkgs	total
2	cereal	2.50	2.0	\$ 5.00
3	milk	1.50	1.0	\$ 1.50
4	eggs	1.00	1.0	\$ 1.00
5	cheese	3.50	2.0	\$ 7.00
6	meat	3.75	1.0	\$ 3.75
7	pasta	1.00	3.0	\$ 3.00
8	totals	13.25	10.0	\$ 21.25

One can also write formulas that refer to cells on other worksheets – *Sheetname!Cell-Reference*

*input!B1 * input!B3 + A1*

When referencing a cell
on the same
spreadsheet as the
active cell the sheet
name is not required.



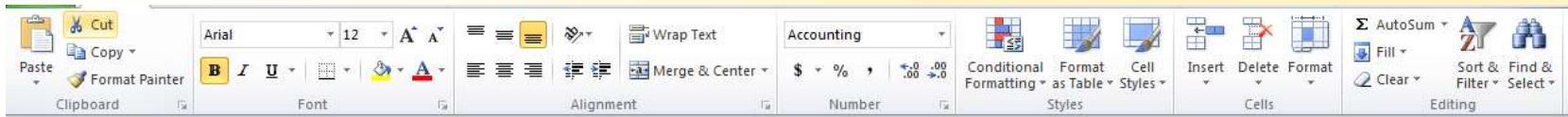
*Sheets may be **named** and displayed with different **colors tabs**,
The **order** of the worksheets may be modified as well.*



File tab – opens menus for opening and saving Files, and modifying Excel Options

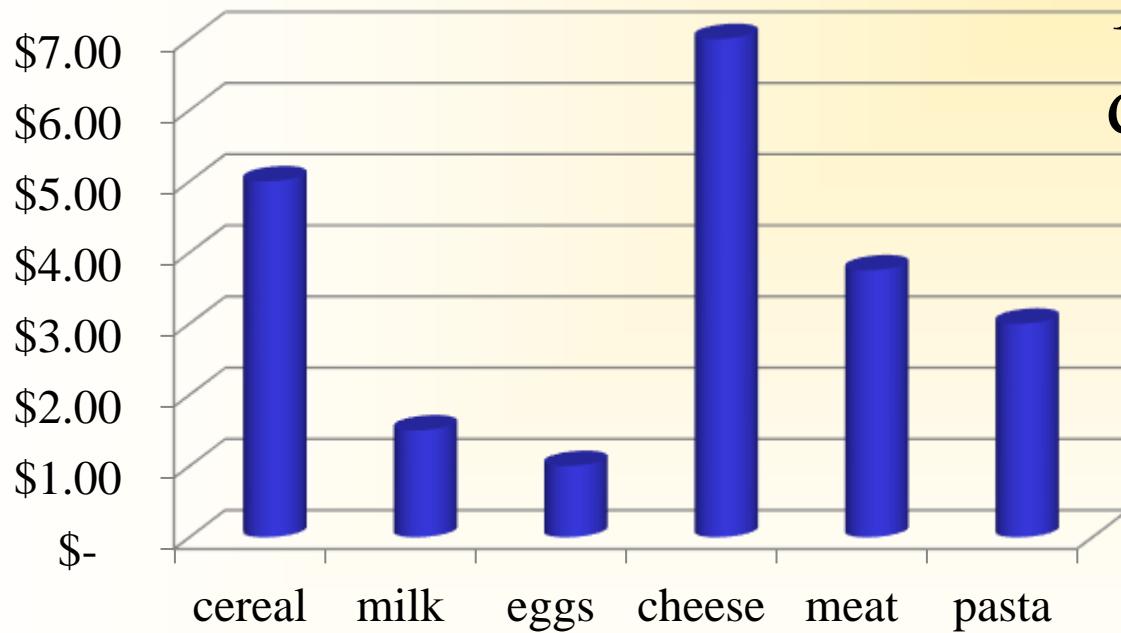


Quick Access Toolbar can be customized to include icons to frequently Used features such as Print Preview



Home Ribbon use to change fonts, justify text, insert rows etc. Ribbons are organized into **Groups** of similar tasks such as the Font group or the Number group. In addition, there are other ribbons containing groups/buttons for laying out pages using the review features etc.





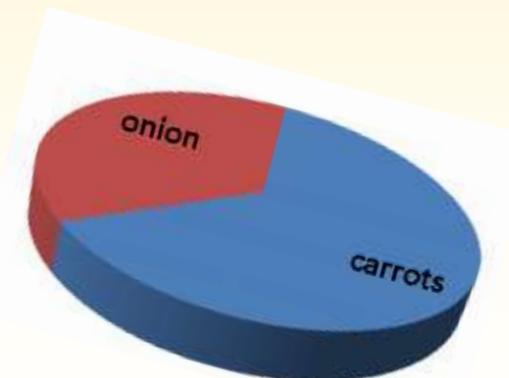
Highlight your
data, select a
Chart type and
Edit & its
done!

The “Power” of using Spreadsheet Applications

	A	B	C	D	
1	Items	\$/each	Quantity	Total	
2	carrots	\$ 1.00	4	\$ 4.00	
3	onion	\$ 0.39	6	\$ 2.34	
4	total			\$ 6.34	
5					

=B2*C2

- Each entry can be related to other values by including cell referencing in *formulas*.
- Formula values are automatically updated when a referenced value changes
- Formulas can be copied
- Charts can be easily generated



Formulas

- A *formula* is a sequence of values, cell references and operators that produce a new value.

$$= E8 + 3*(E10 - E11)$$

- Formulas always start with an equal sign =
- In addition a formula can also contain built-in *functions* like SUM, AVERAGE, IF, COUNTIF, etc. $=Sum(A2:A8)*2$



Things you need to know when writing formulas in Excel

- Data precision vs. cell display

0.02349	0.02
---------	------

- Types of operators that can be used

/	\leq	-
---	--------	---

- Order of precedence of operators

=B2+B3*B1/B8^2



In order to write Excel formulas we also need to use the correct Operator Symbols

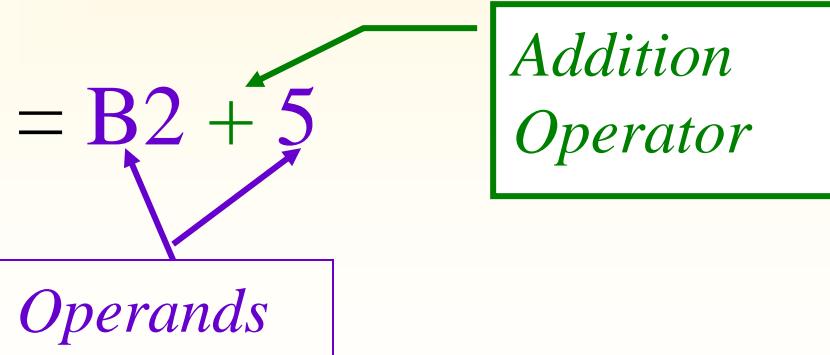
Formulas contain two types of components:

- **Operators**: Operations to be performed

Arithmetic operators: * / + - ^

Relational operators: >, <, <=, >=, <>, =

- **Operands**: Values to be operated on



Precision: number of decimal places stored in the computer.

Formatted Display: number of decimal places that appear in a cell

Type in a cell : =**1/8**

display in cell

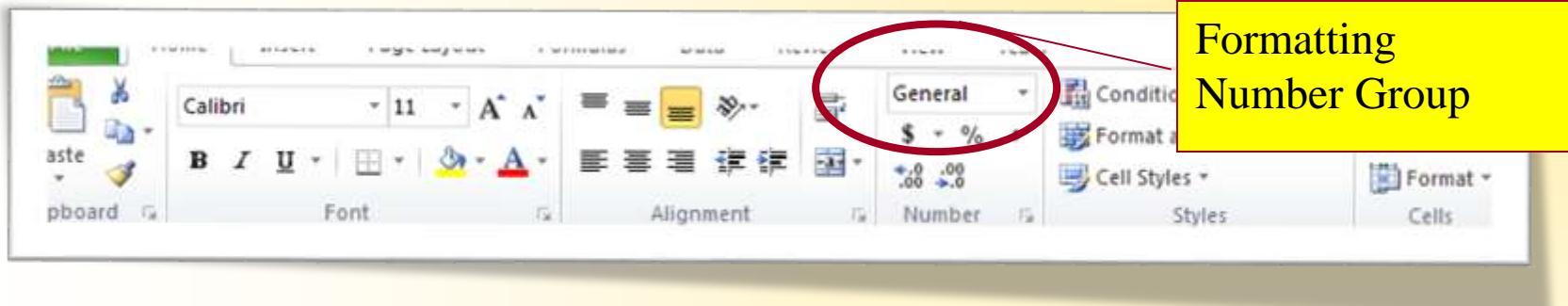
	A	B
1	0 places	0
2	1 decimal	0.1
3	2 decimal	0.13
4	3 decimal	0.125
5		

What value results for each - if multiplied by 1000?

Does the addition appear to be correct in col B?

	A	B
1	21.4	21
2	51.3	51
3	98.1	98
4	170.8	171

Formatting affects display not the precise value:



Percent 

Currency 

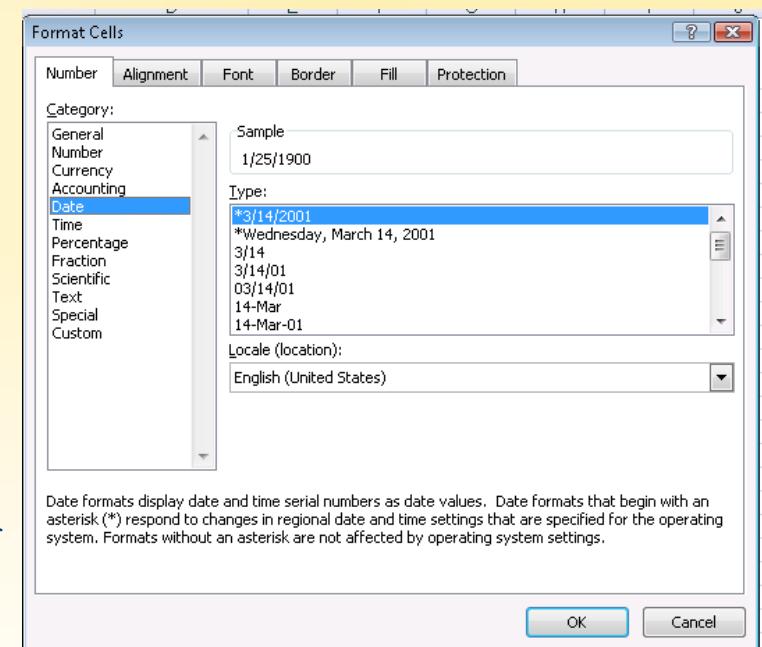
Decimal Display 
Commas 



Values can also be used to display dates

	A	B
1	1/27/2013	Friday, February 01, 2013

- Dates are *values* that can be entered in several *formats*: January 27, 2013 or 1/27/2013
- Excel converts these dates to a numerical representation (1/22/2013 → 41301)
- Thus dates may be used in formulas: =A1-B1 will result in the value 5



Note: To do arithmetic calculations with dates if you type =1/27/2013-1/22/2013 directly in a cell it does not interpret it a date – cell references must be used.



Microsoft Excel Vocabulary

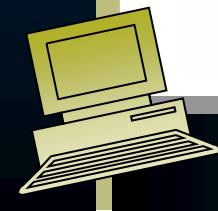
- **Workbook** - an Excel file with one or more sheets or pages
- **Worksheet** - page in the workbook (*spreadsheet*)
- **Ribbon** – Tabbed section containing command icons
- **Row** - Horizontal (Row Number)
- **Column** - Vertical (Column Letter)
- **Cell** - Column/Row combination (ex: C3)
- **Values** - Numeric Entries used in calculations
- **Labels** - text that describes the data
- **Active Cell** - cell currently in use (highlighted)
- **Formula Bar** - top of spreadsheet where Excel displays the value or formula for that cell



A Multiplication Table

	A	B	C	D	E	F
1		1	2	3	4	5
2	1	1	2	3	4	5
3	2	2	4	6	8	10
4	3	3	6	9	12	15
5	4	4	8	12	16	20
6	5	5	10	15	20	25

What formula would you write in cell B2 to calculate the product. This formula must work when copied down the column and across the row to form the 5's Multiplication table.



Multiplication Table For 5

- To have a reference that always points to row 1,
- use something in the format of B\$1.
- To have a reference that points to column A, use a reference in the format of \$A2.
- As shown in the figure, the formula you want to enter in B2 is
=\$A2*B\$1.

=\$A2*B\$1
=\$A3*B\$1
=\$A4*B\$1
=\$A5*B\$1
=\$A6*B\$1

	A	B	C	D	E	F
1		1	2	3	4	5
2	1		2	3	4	5
3	2		4	6	8	10
4	3	2		6	9	12
5	4	3	6		12	15
6	5	4	8	12		20
	5	5	10	15	20	25

Home

Insert

Page Layout

Formulas

Data

Review

View

Add-Ins



Clipboard

Calibri

11



General

\$ % ,

.00 .00

Number

 Σ 

C3



contents of an active cell

A

B

C

D

E

F

G

H

I

1

2

3

4

5

6

7

8

9

10

11

sheet tab

contents of an active cell

active cell
(C3: column C, row 3)Formula
bar

Worksheet Window

- Headings
 - Columns (letters at the top) A, B, C
 - Rows (numbers along the side) 1, 2, 3
- Cell
 - intersection of a row and column
- Cell reference
 - Example: **A1**
- Active cell
 - cell you currently working on
- Range
 - cell or rectangular block of cells designated with the colon
 - Example: **A1:A5** says “cells A1 through A5”
- Sheet tabs at the bottom for “sheets” (pages) of workbook

Example Formulas

- Add cells:

=A1+A2

=B14+F23

=A1+A2+A3+A4+A5

=A1+A2+A3+A4+A5

=(A1+A2)/2

=MIN(A1:A3)

=MAX(A1:A3)

- Multiply cells:

=A1*A2

- Makes a decision

- Format:

- $=IF(condition, what\ to\ do\ if\ true, what\ to\ do\ if\ false)$

- Put quotes around text argument

$=IF(A1>=60, "Pass", "Fail")$

Functions

What is a function?

- A function is a "named operation"
- Functions have
 - a name
 - parentheses
 - parameters/arguments inside the parentheses
 - The words parameter and argument mean the same thing
 - you can have many parameters for one function separated with commas (,)
 - The number of parameters is one more than the number of commas.

Terminology

SUM(1,2,3,4,5)

- The **name** of the function is "SUM"
- The **parameters** or **arguments** to this function are 1,2,3,4 and 5
- The entire thing, i.e. SUM(1,2,3,4,5), is a **function call**
- The **value** of this function call is 15.
Another way to say this is that this function call **returns** 15.

=SUM(F6:F11)

The diagram shows the formula '=SUM(F6:F11)' with three orange arrows pointing to its parts. The first arrow points to the '=' sign and is labeled 'Equal sign'. The second arrow points to the word 'SUM' and is labeled 'Function name'. The third arrow points to the range 'F6:F11' and is labeled 'Argument'.

- **Arithmetic operator**
- + (plus sign)
- – (minus sign)
- * (asterisk)
- / (forward slash)
- % (percent sign)
- ^ (caret)
- **Meaning and Example**
- Addition $3+3$
- Subtraction $3-1$ or Negation -1
- Multiplication $3*3$
- Division $3/3$
- Percent 20%
- Exponentiation 3^2

Comparison operators compare two values and then produce the logical value TRUE or FALSE.

- | | |
|--|--|
| <ul style="list-style-type: none">□ Comparison operator□ = (equal sign)□ > (greater than sign)□ < (less than sign)□ >= (greater than or equal to sign)□ <= (less than or equal to sign)□ <> (not equal to sign) | <ul style="list-style-type: none">□ Meaning & Example□ Equal to A1=B1□ Greater than A1>B1□ Less than A1<B1□ Greater than or equal to A1>=B1□ Less than or equal to A1<=B1□ Not equal to A1<>B1 |
|--|--|

Ranges

- A rectangular box of cells is called a “range”.
- Example: A1:B2 is shorthand for A1,A2,B1,B2

A1:B2



	A	B	C	D
1				
2				
3				
4				

B2:B5



	A	B	C
1			
2			
3			
4			
5			
6			
7			

without a range

=SUM(A1,B1,C1,A2,B2,C2,A3,B3,C3,A4,B4,C4)

with a range

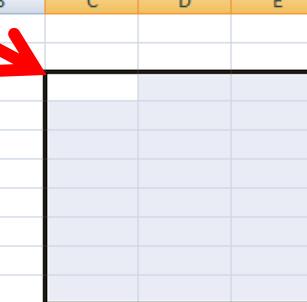
=SUM(A1:C4)

C3:E10

	B	C	D	E	F
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					

B3:E3

	A	B	C	D	E	F
1						
2						
3						
4						



Questions

=SUM(a1,a2,b1,b2,100,c4,c5,c6,c7,d3)

Write the function as multiple ranges and cells as parameters ?

=SUM(a1:b2,100,c4:c7,d3) is the same as above

A	B		C	D
1	Vendor #	January	February	March
2	135	\$ 547.25	\$ 1,324.00	\$ 654
3	354	\$ 452.14	\$ 13.00	\$ 2,134
4	645	\$ 656.00	\$ 2,133.00	\$ 123
5	687	\$ 1,212.00	\$ 22.00	\$ 1,135
6	646	\$ 667.00	\$ 214.00	\$ 234
7	1456	\$ 1,234.00	\$ 1,234.00	\$ 314
8	5468	\$ 1,654.00	\$ 143.00	\$ 134
9	1267	\$ 1,231.00	\$ 213.00	\$ 1,456
10	2138	\$ 123.00	\$ 234.00	\$ 21
11		=B2+B3+B4+B5+B6+B7+B8+B9+B10		

? As a Function

=SUM(B2:B10)

Original formula with mixed cell references
(relative column references and absolute row references)

A	B
1	
2	
3	100
4	125
5	=A\$3+A\$4
6	
7	=B\$3+B\$4

Relative column references shift based on new location of copied formula; absolute row references remain unchanged

MIN and MAX

- The MIN function returns the smallest number in a set of values.
- The MAX function returns the largest value in a set of values.
- Logical values and text within the range will be ignored with both functions.

C	ColumnC	D	ColumnD	E
	10,000.00		6,031.50	OK
	5,000.00		12,262.00	INCREASE
	13,000.00		4,830.00	OK
	8,000.00		16,394.99	INCREASE
	500.00		560.00	INCREASE
	2,200.00		790.00	OK
	2,000.00		1,396.00	OK
	15,000.00		0.00	OK
=MIN(C2:C9)	MIN=	500.00		
=MAX(C2:C9)	MAX=	15,000.00		

IF function

The IF function checks whether a condition is met, and returns one value if TRUE and another value if FALSE.

Syntax: IF(logical_test,value_if_true,value_if_false)

Example:

IF(D2>C2,"INCREASE","OK")

This formula checks to see if the value in column D is greater than the value in column C.

If it is, it will show INCREASE in column E. If not, it puts OK in column E.

AVERAGE and ROUND

The AVERAGE function returns the average (arithmetic mean) of its arguments.

=AVERAGE(A2:A9)

The ROUND function rounds a number to a specified number of digits.

=ROUND(A2,-3)

This example rounds the numbers to the next thousand.

	A	B	C	D	E	F
1						
2	Numbers			The Next to Ten	The Next to Hundred	The Next to Thousand
3	12500			12500	12500	13000
4	11250			11250	11300	11000
5	3956			3960	4000	4000
6	4498			4500	4500	4000
7	375			380	400	0
8	675			680	700	1000

Write the required function for the specified columns into only D3, E3 and F3, respectively

A	ColumnA
	27,784.00
	28,705.00
	14,844.00
	9,501.00
	0.00
	2,190.00
	1,464.00
	13,600.00
AVERAGE	12,261.00

A	B
ColumnA	ROUNDED
27784.00	28,000.00
28705.00	29,000.00
14844.00	15,000.00
9501.00	10,000.00
0.00	0.00
2190.00	2,000.00
1464.00	1,000.00
13600.00	14,000.00

=ROUND(B3,-3)

=ROUND(B3,-2)

=ROUND(B3,-1)

The num_digits argument

- Positive num_digits round to the specified number of decimal places
- A zero results in a whole number
- Negative num_digits round values to tens, hundreds etc.

	A	B	C	D	E
1	6375.28683				
2	Formula	num_digits			
3	ROUND(A1,3)	3	6375.287		
4	ROUND(A1,2)	2	6375.29		
5	ROUND(A1,1)	1	6375.3		
6	ROUND(A1,0)	0	6375		
7	ROUND(A1,-1)	-1	6380		
8	ROUND(A1,-2)	-2	6400		
9	ROUND(A1,-3)	-3	6000		



Count Functions

- To count the number of cells that contain numbers, use the following **COUNT** function.
- To count cells based on one criteria (for example, higher than 9), use the following **COUNTIF** function.
 - **Note:** in contrast to the COUNT function, cells can contain text as well.
- To count cells based on multiple criteria (for example, green and higher than 9), use the following **COUNTIFS** function.

```
=COUNT(A1:A5)
```

```
=COUNTIF(B1:B5,>45")
```

```
=COUNTIFS(C1:C5,"BLUE",D1:D5,>65")
```

	A	B	C	D
1	10	25	YELLOW	99
2	20	45	BLUE	75
3		36	YELLOW	15
4	45	44	BLUE	85
5	22	78	RED	100
6				
7	4	1	2	-

Sum Functions

- To sum cells based on one criteria (for example, smaller than 10), use the following **SUMIF** function (two arguments).
- To sum cells based on multiple criteria (for example, blue and green), use the following **SUMIFS** function (first argument is the range to sum).

	A	B	C	D	E	F
1		8		Tarkan	Zehra	75
2		33		Veli	Ayse	15
3		9		Deli	Hacca	65
4		22		Tarkan	Hacca	30
5		10		Markan	Ayse	60
6				Tarkan	Hacca	25
7		17				55

```
=SUMIF(B1:B5,"<10")
```

```
=SUMIFS(F1:F6,D1:D6,"Tarkan",E1:E6,"Hacca")
```

Logical Functions

- The **AND** Function returns TRUE if all conditions are true and returns FALSE if any of the conditions are false.
- The **OR** Function returns TRUE if any of the conditions are TRUE and returns FALSE if all conditions are false.

```
=IF(AND(A1>30,B1<45),"Correct","Incorrect")
```

	A	B	C	D
1	24	36		Incorrect
2				
3	Color	Price	Flag	
4	red	\$120.00	OK	=IF(OR(A4="red",A4="green"),"OK","EXPENSIVE")
5	green	\$75.00	OK	
6	red	\$85.00	OK	
7	blue	\$325.00	EXPENSIVE	
8	red	\$100.00	OK	
9	blue	\$45.00	EXPENSIVE	



Statistical Functions

- To average cells based on one criteria, use the following **AVERAGEIF** function.
- To find the most frequently occurring number, use the following **MODE** function
- To calculate the standard deviation, use the following **STDEV** function.
- To find the first largest number, use the following **LARGE** function.
- To find the second smallest number, use the following **SMALL** function

=AVERAGEIF(A1:F1,>15")

=MODE(A3:I3)

=STDEV(A5:D5)

=LARGE(A5:D5,1)

=SMALL(A5:D5,2)

=LARGE(A5:D5,3)



	A	B	C	D	E	F	G	H	I	J	K
1	60	50	9	15	20	30		40			
2											
3	9	8	4	8	6	8	6	4	8		8
4											
5	30	20	40	70		21.60247					
6											
7						70					
8						30					

Questions- 1:

You must use the Excel table given below for the questions.

- Q1: Write the formula to check if the money received by your company is the same as the value of the invoices Like **TURE** or **FALSE** for the cell “**D2**”
- Q2: Enter the formula that finds the number of the amounts in the column “**Amount Invoice**” between **200** and **400** for the cell “**B8**”
- Q3: Enter the formula that writes “**Deficiency**” or “**Not Deficiency**” for the cell “**E2**”
 - If the difference among the amount invoice and the amount received is greater than **200** and the column “**Test?**” is false, “**Deficiency**” otherwise “**Not Deficiency**”.
- Note that:
 - You must use only the function “**IF**” For Q1
 - You must use only the function “**COUNTIFS**” for Q2
 - You must use only the function “**IF**” for Q3

	A	B	C	D	E
1	Invoice-Number	Amount Invoice	Amount Received	Test ?	Status
2	INV-001	217.48	217.48		
3	INV-002	442.96	142.86		
4	INV-003	328.12	328.12		
5	INV-004	109.99	109.99		
6	INV-005	300.01	300.89		
7	INV-006	125.93	128.93		
8	Number of The Amounts:				
9					

ANSWERS-1

	A	B	C	D	E
1	Invoice-Number	Amount Invoice	Amount Received	Test ?	Status
2	INV-001	217.48	217.48	TRUE	Not Deficiency
3	INV-002	442.96	142.86	FALSE	Deficiency
4	INV-003	328.12	328.12	TRUE	Not Deficiency
5	INV-004	109.99	109.99	TRUE	Not Deficiency
6	INV-005	300.01	300.89	FALSE	Not Deficiency
7	INV-006	125.93	128.93	FALSE	Not Deficiency
8	Number of Th	3			

=IF(B2=C2,"TRUE","FALSE")

=COUNTIFS(B2:B7,>200, B2:B7,<400")

=IF((B2-C2)>200,(IF(D2="FALSE","Deficiency","Not Deficiency")),"Not Deficiency")

Using “AND”

=IF(AND(B2-C2>200, D2="FALSE"), "Deficiency", "Not Deficiency")

Questions-2: You must use the Excel table given below for the questions.

- Q1: Write the formula to convert scores to grades with respect to:
 - Score > 89 grade="A", score > 79 and < 90 grade="B", score > 69 and < 80 grade="C"
 - Score > 59 and < 70 grade="D" score < 60 grade "F".
- Note that:
 - You must use only the function "**IF**" For the cell "**C2**"
 - You must use both of the functions "**IF**" and "**AND**" for "**D2**"

	A	B	C	D
1	Students	Scores	Grades For First Way	Grades For Second Way
2	Larry	98		
3	Carla	70		
4	Micheal	84		
5	Denial	62		
6	Andy	56		
7	Glyn	68		
8	Amy	92		
9				



ANSWERS-2

	A	B	C	D
1	Students	Scores	Grades For First Way	Grades For Second Way
2	Larry	98	A	A
3	Carla	70	C	C
4	Micheal	84	B	B
5	Denial	62	D	D
6	Andy	56	F	F
7	Glyn	68	D	D
8	Amy	92	A	A

```
=IF(B2>89,"A",IF(B2>79,"B",IF(B2>69,"C",IF(B2>59,"D","F"))))
```

```
=IF(B2>89,"A",IF(AND(B2>79,B2<90),"B",IF(AND(B2>69,B2<80),"C",IF(AND(B2>59,B2<70),"D",IF(B2<60,"F")))))
```

```
=IF(B2>89,"A",IF(B2>79,IF(B2<90,"B"),IF(B2>69,IF(B2<80,"C"),IF(B2>59,IF(B2<70,"D"),"F"))))
```

Questions-3:

You must use the Excel table given below for the questions.

- Q1: Enter a formula into the cell “**E2**” for the arithmetic mean of the scores given in the cells “**B2**”, “**C2**” and “**D2**”
- Q2: Apply a formula to the cell “**F2**” that returns the result:
 - **Pass** if the first score is greater than or equal to 50 and the second score is greater than or equal to 60 and the third score is greater than 75.
 - Otherwise **Fail**.
- Q3: Insert a formula into the cell “**G2**” that calculates the bonus for each student. A \$500 bonus is paid if a student meets either “70” in cell “**E2**” or “**Pass**” in cell “**F2**”, otherwise they earn \$0 bonus.
- Note that:
 - You must **NOT** use the function “**SUM**” or any “**operators**” for the cell “**E2**”
 - You must use only the functions “**IF**” and “**AND**” for “**F2**”
 - You must use only the functions “**OR**” and “**IF**” for “**G2**”



ANSWERS-3

	A	B	C	D	E	F	G
1	Students	Scores 1	Scores 2	Scores 3	Mean	Result	Status
2	Larry	98	10	20	42.6667	Fail	\$0
3	Carla	70	100	80	83.3333	Pass	\$500
4	Micheal	40	70	80	63.3333	Fail	\$0
5	Denial	62	66	20	49.3333	Fail	\$0
6	Andy	60	60	100	73.3333	Pass	\$500
7	Glyn	68	70	5	47.6667	Fail	\$0
8	Amy	92	0	5	32.3333	Fail	\$0

=AVERAGE(B2:D2)

=IF(AND(B2>=50,C2>=60,D2>75),"Pass","Fail")

=IF(OR(E2>=70,F2="Pass"),"\$500","\$0")



Conditional formatting

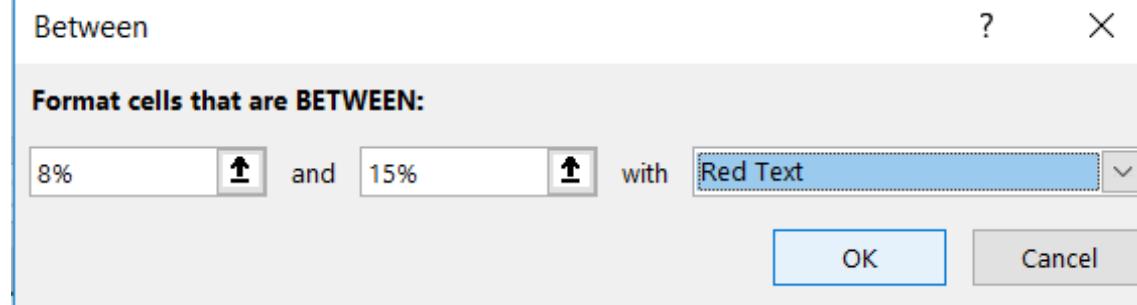
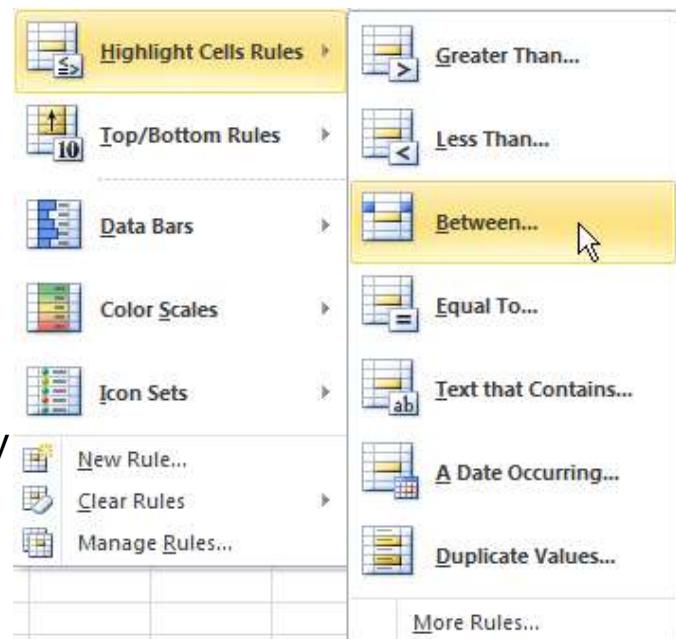
- Conditional formatting in Excel is a tool that allows you to change the appearance of a cell or range of cells based on the contents of the cells.
 - There are several types of conditional formatting rules built in to Excel and many more options available through customization.
 - These options are helpful for highlighting trends, mistakes in data, and variances that fall outside an expected range.

The screenshot shows the Microsoft Excel ribbon with the 'Home' tab selected. In the font group, 'Calibri' is chosen with a font size of 16. The 'Conditional Formatting' button in the styles group is selected, displaying a dropdown menu. The 'Highlight Cells Rules' option is chosen, which has opened a sub-menu titled 'Greater Than...'. This dialog box contains a text input field with the value '50' and a dropdown menu showing various format options. The first option in the list is 'Green Fill with Dark Green Text', which is highlighted. The main Excel window shows a 9x2 grid of numbers. The first two columns (A and B) are fully visible, while the third column (C) is partially visible on the right.

	A	B
1	125	
2	36	36
3	44	44
4	12	12
5	6	6
6	15	15
7	76	76
8	96	96
9		

Highlighting cells

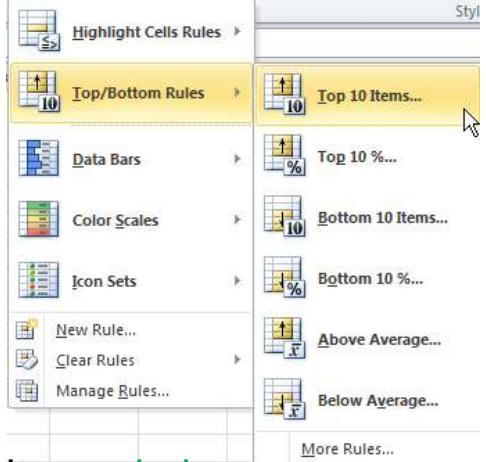
1. Open up the file **Highlight.xlsx**
2. Select cells B28 to F35
3. On the Home tab, click on the Conditional Formatting icon.
4. Hover over **Highlight Cell Rules**.
5. Use the boxes to specify that you want to fill cells **red** if they contain a value between 8% and 15% and click OK.



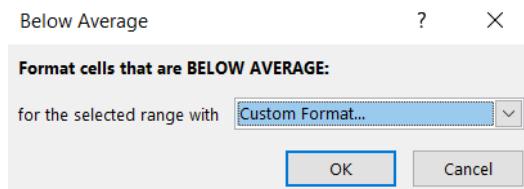
25	Age Group	10-18	19-25	26-40	41-55	56+
26	Flavour	14%	11%	7%	14%	25%
27		17%	7%	7%	13%	7%
28	Vanilla	25%	29%	25%	13%	11%
29	Strawberry	12%	20%	31%	35%	27%
30	Chocolate	13%	8%	7%	7%	13%
31	Coffee	8%	8%	6%	3%	2%
32	Lime	4%	9%	12%	9%	12%
33	Blue Heaven	7%	7%	6%	6%	3%
34	Other					

Top and Bottom Rules

1. Open up the file **TopandBottom.xlsx**
2. Select cells B5 to B26
3. On the Home tab, click on the Conditional Formatting icon.
4. Hover over **Top/bottom rules**.
5. Click on **Top 10 items**.
6. Use the boxes to specify that you want to fill cells containing the top 5 items **dark green**.



1. Select cells C5 to C26
2. On the **Home** tab, click on the **Conditional Formatting**
3. Hover over **Top/bottom rules**.
4. Click on **Below Average**.
5. Use the boxes to specify that you want to fill cells custom which contain a figure that is below the average for the selected cells.



	A	B	C	D
3		People	People	Sales
4		Registered	Attended	Generated
5	Manchester	250		£ 12,500
6	Liverpool	310		£ 7,800
7	Bournemouth	170		£ 9,800
8	Reading	390		£ 10,750
9	Bristol	400	415	£ 672
10	Durham	210		£ 4,500
11	Dublin	150		£ 8,900
12	Edinburgh	275	290	£ 270
13	Luton	540	510	£ 7,987
14	Hull	415	412	£ 15,794
15	Swansea	189		£ 8,900
16	Cardiff	401	387	£ 7,804
17	Plymouth	230		£ 7,656
18	Stafford	430	450	£ 9,871
19	Huddersfield	290	295	£ 8,471
20	Belfast	178		£ 5,313
21	London South	540	510	£ 14,941
22	London North	320	319	£ 12,984
23	Sunderland	165		£ 8,981
24	Norwich	189		£ 7,719
25	Coventry	410	300	£ 4,711
26	York	290		£ 8,894

More predefined formatting

1. Select the range B4 to G11
2. On the Home tab, click on the Conditional Formatting icon.
3. Hover over **Data bars** and choose one of the options.

The screenshot shows the Microsoft Excel ribbon with the Home tab selected. In the ribbon, the Conditional Formatting icon is highlighted. A dropdown menu is open under 'Conditional Formatting', specifically the 'Data Bars' section. The 'Data Bars' section is expanded, showing various color options for data bars. A tooltip for the 'Light Blue Data Bar' option is displayed, stating: 'Add a colored data bar to represent the value in a cell. The higher the value, the longer the bar.' The main table area shows data for different modules across five age groups, with data bars applied to the values in columns B through G.

Module	Age Group					Total
	10-18	19-25	26-40	41-55	56+	
Sausages	25	20	12	25	45	127
ICT	30	12	12	23	12	89
Human An	45	52	45	24	20	186
The scienc	22	36	56	63	48	225
Blended L	24	15	12	13	23	87
Digital me	14	15	11	5	4	49
Statistics	8	17	22	17	22	86
Crop rotat	12	13	10	10	6	51

More predefined formatting

Directional



1. Select the range B4 to B15
2. On the **Home** tab, click on the **Conditional Formatting** icon.
3. Hover over **Icon sets** and choose the first option.

The screenshot shows the Microsoft Excel ribbon with the 'Home' tab selected. In the 'Conditional Formatting' section of the ribbon, the 'Icon Sets' option is highlighted. A tooltip for '3 Arrows (Colored)' is displayed, stating: 'Choose a set of icons to represent the values in the selected cells.' Below the tooltip, there are sections for 'Shapes', 'Indicators', and 'Ratings', each displaying various icon options. The main area of the ribbon shows other conditional formatting rules like 'Highlight Cells Rules', 'Top/Bottom Rules', 'Data Bars', and 'Color Scales'. The Excel worksheet below the ribbon contains a table with columns 'Student' and 'Mark', and rows numbered 1 through 15. The 'Mark' column uses the '3 Arrows (Colored)' icon set, where green arrows indicate higher values and red arrows indicate lower values.

	A	B	C	D	E	F	G
1	Grades						
2							
3	Student	Mark					
4	Fred	80					
5	Jane	30					
6	Bill	55					
7	Chris	63					
8	Jill	32					
9	Jon	77					
10	Lucy	44					
11	Katie	76					
12	Marion	42					
13	Adam	99					
14	Fiona	65					
15	Faye	12					
16							
17							
18							
19							
20							
21							
22							

Chart-1

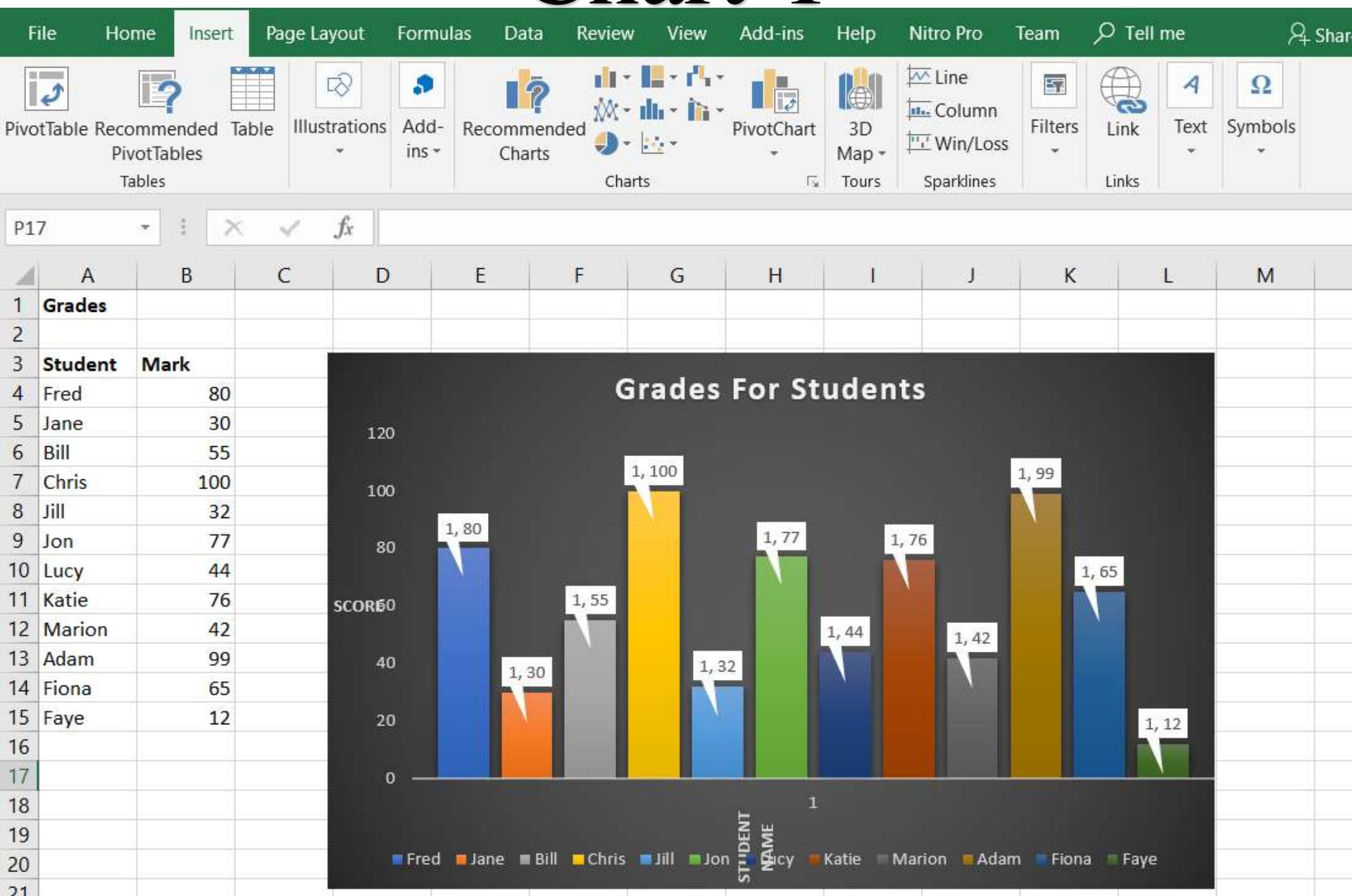


Chart-2

File Home Insert Page Layout Formulas Data Review View Add-ins Help Nitro Pro Team Tell me what you want to do Share

C23

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1		Age Group														
2		10-18	19-25	26-40	41-55	56+	Total									
3	Sausages	25	20	12	25	45	127									
4	ICT	30	12	12	23	12	89									
5	Human An	45	52	45	24	20	186									
6	The science	22	36	56	63	48	225									
7	Blended Le	24	15	12	13	23	87									
8	Digital me	14	15	11	5	4	49									
9	Statistics	8	17	22	17	22	86									
10	Crop rotat	12	13	10	10	6	51									
11																
12																
13																
14																
15																
16																
17																
18																
19																
20																
21																
22																
23																

AGE GROUP

The chart displays the distribution of five age groups (56+, 41-55, 26-40, 19-25, 10-18) across eight categories. The categories are: CROP ROTATION, STATISTICS, DIGITAL MEDIA, BLENDED LEARNING, THE SCIENCE OF DR WHO, HUMAN ANATOMY, ICT, and SAUSAGES IN THE MIDDLE AGES. The x-axis represents the count of each age group, ranging from 0 to 70. The bars are color-coded by age group: 56+ (blue), 41-55 (yellow), 26-40 (grey), 19-25 (orange), and 10-18 (dark blue). In all categories, the 10-18 age group has the highest count, followed by 56+, 41-55, 26-40, and 19-25.

Category	10-18	41-55	26-40	19-25	56+
CROP ROTATION	8	10	12	14	15
STATISTICS	22	18	24	20	12
DIGITAL MEDIA	5	7	11	15	8
BLENDED LEARNING	24	12	10	15	22
THE SCIENCE OF DR WHO	48	55	35	38	45
HUMAN ANATOMY	45	22	45	52	20
ICT	12	22	10	15	15
SAUSAGES IN THE MIDDLE AGES	45	25	12	20	25

Questions



Computer Network & Internet





Networking

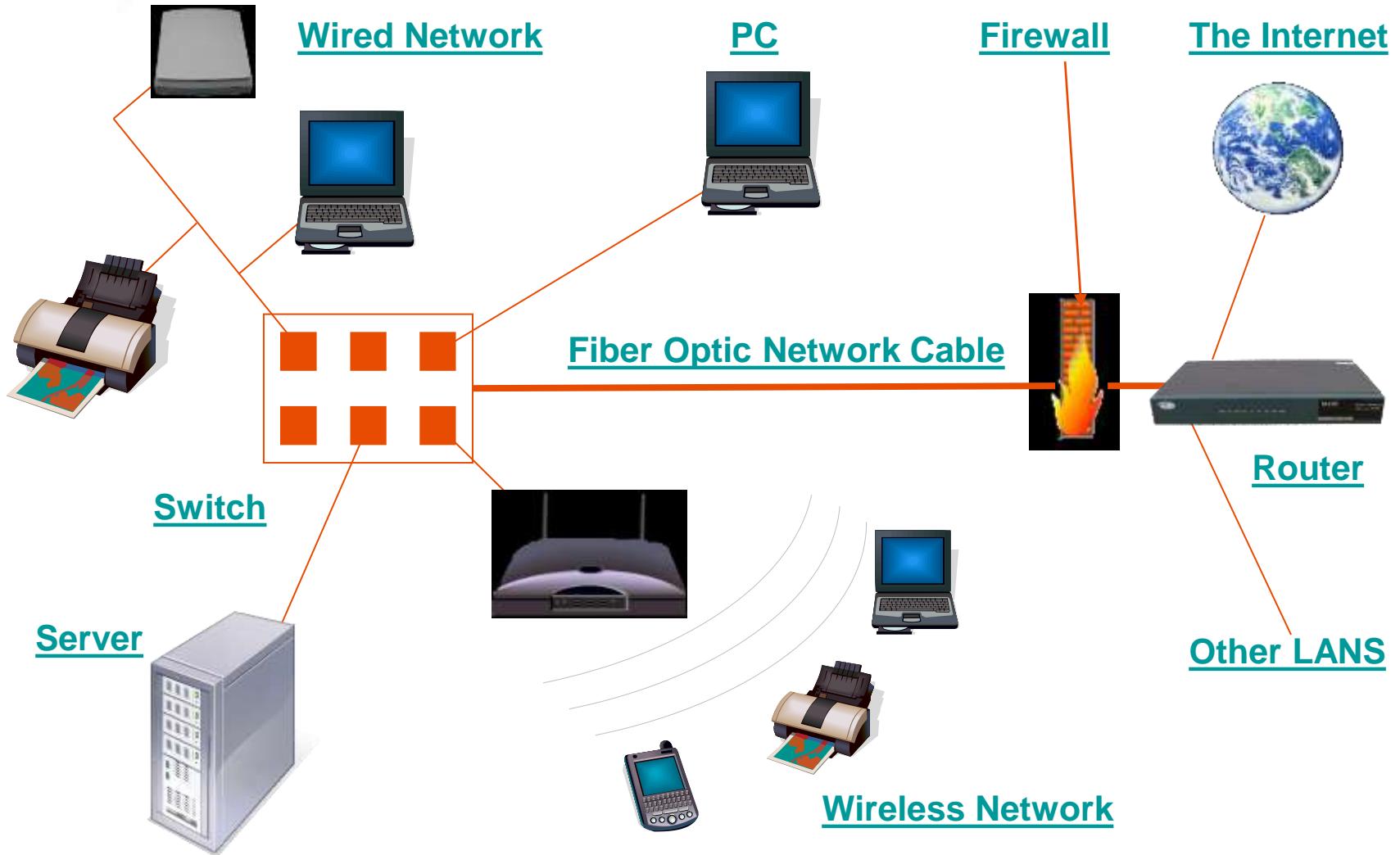
- Computer network A collection of computing devices that are connected in various ways in order to communicate and share resources.
- The computers on a network may be linked through cables, telephone lines, radio waves, satellites etc.
- A popular example of a computer network is the Internet, which allows millions of users to share information.



Networking

- The generic term **node** or **host** refers to any device on a network
- **Data transfer rate** The speed with which data is moved from one place on a network to another
- Data transfer rate is a **key issue** in computer networks

The Network Diagram



Networking

- Computer networks have opened up an entire frontier in the world of computing called the **client/server model**

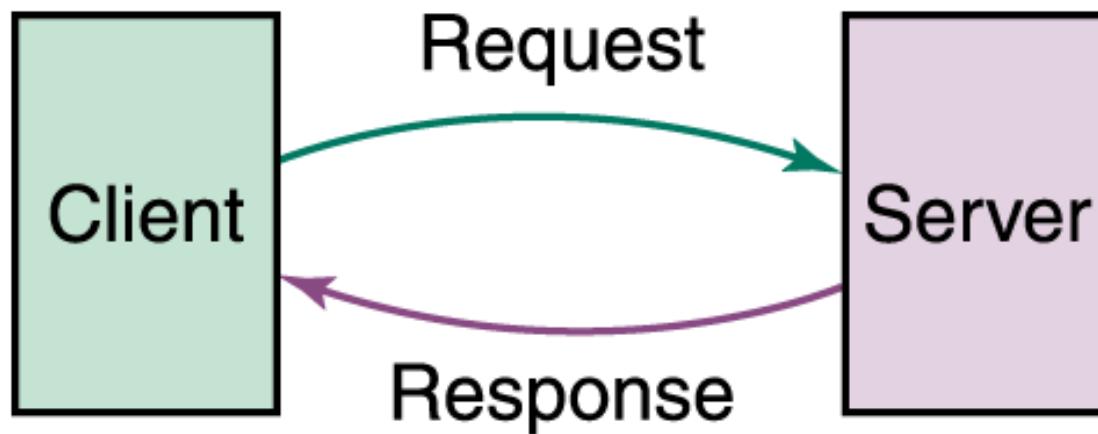


Figure 1.1 Client/Server interaction



Networking

- **File server** A computer that stores and manages files for multiple users on a network
- **Web server** A computer dedicated to responding to requests (from the browser client) for web pages

GOALS AND APPLICATIONS OF COMPUTER NETWORKS



1st goal: Resource Sharing

- The goal is to make all programs, equipment, and especially data available to anyone on the network without regard to the physical location of the resource and the user.
- **Equipment:**
Disk Drives, Printers, Scanners, CD And DVD Burners, Projectors...
- **Information:**
Customer records, Product information ,inventories, financial statements, tax information...

FOR EXAMPLE: FOLDERS, DOCUMENTS, MUSIC, PHOTOS, VIDEOS, RECORDED TV SHOWS, AND MORE.

2nd goal: A Computer network to do with people

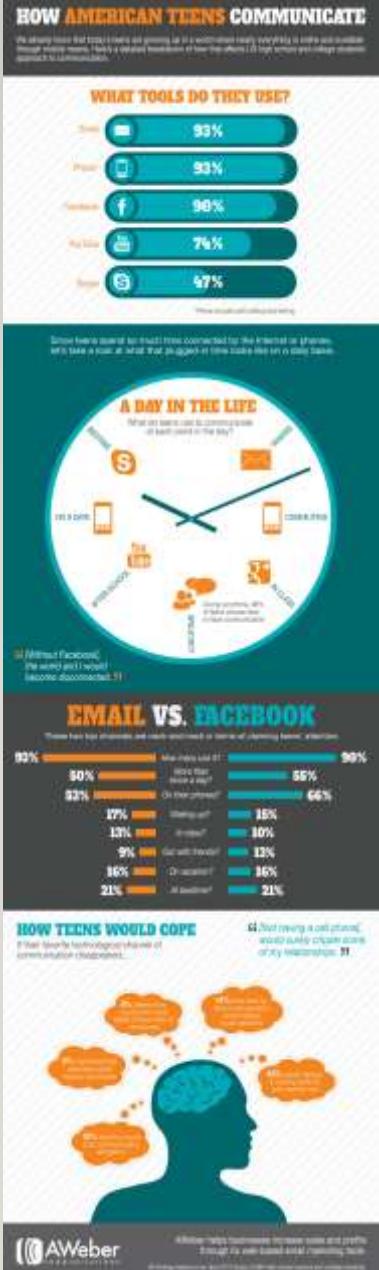
- A second goal of setting up a computer network has to do with people rather than information or even computers.
- A computer network can provide a powerful **communication medium** among employees.

❑ Email

❑ Cooperate with other to work

❑ VoIP

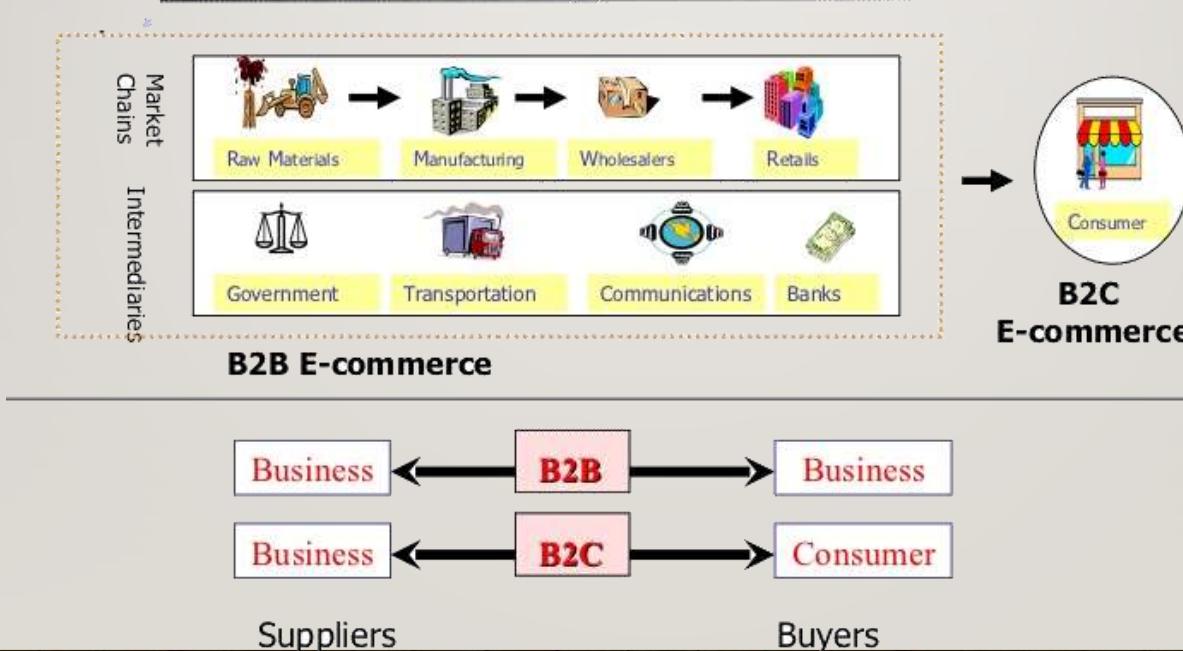
❑ Videoconferencing



3rd goal: e-Commerce

- A third goal for many companies is doing business electronically with other companies, especially suppliers and customers.
- e-Commerce
 - ❑ B2B: Manufacturers and its suppliers. This is business to business
 - ❑ B2C: companies and its customers. This is business to consumer

B2B vs. B2C E-Commerce



Advantages of Computer Networks

- **File Sharing:** Networks offer a quick and easy way to share files directly.
- **Resource Sharing:** All computers in the network can share resources such as printers, fax machines, modems and scanners.
- **Communication:** Those on the network can communicate with each other via e-mail, instant messages etc.
- **Flexible Access:** Networks allow their users to access files from computers throughout the network.
- **Sharing of Information:** Computer networks enable us to share data and information with the computers that are located geographically large distance apart.

THE DISADVANTAGES (COSTS) OF NETWORKING

- **Network Hardware, Software and Setup Costs**
- **Hardware and Software Management and Administration Costs**
- **Undesirable Sharing**
- **Illegal or Undesirable Behavior**
- **Data Security Concerns**

NETWORK APPLICATIONS

- ▶ Access to remote programs.
 - ▶ Access to remote databases.
 - ▶ Value-added communication facilities.
-
- A VAN (value added network) is a private network provider that focuses on offering network services such as secure email, message encryption and management reporting.
 - The goal of these services is to facilitate EDI (electronic data interchange) among online companies, providing a convenient way for ecommerce businesses to securely communicate and share data.

Types of Networks

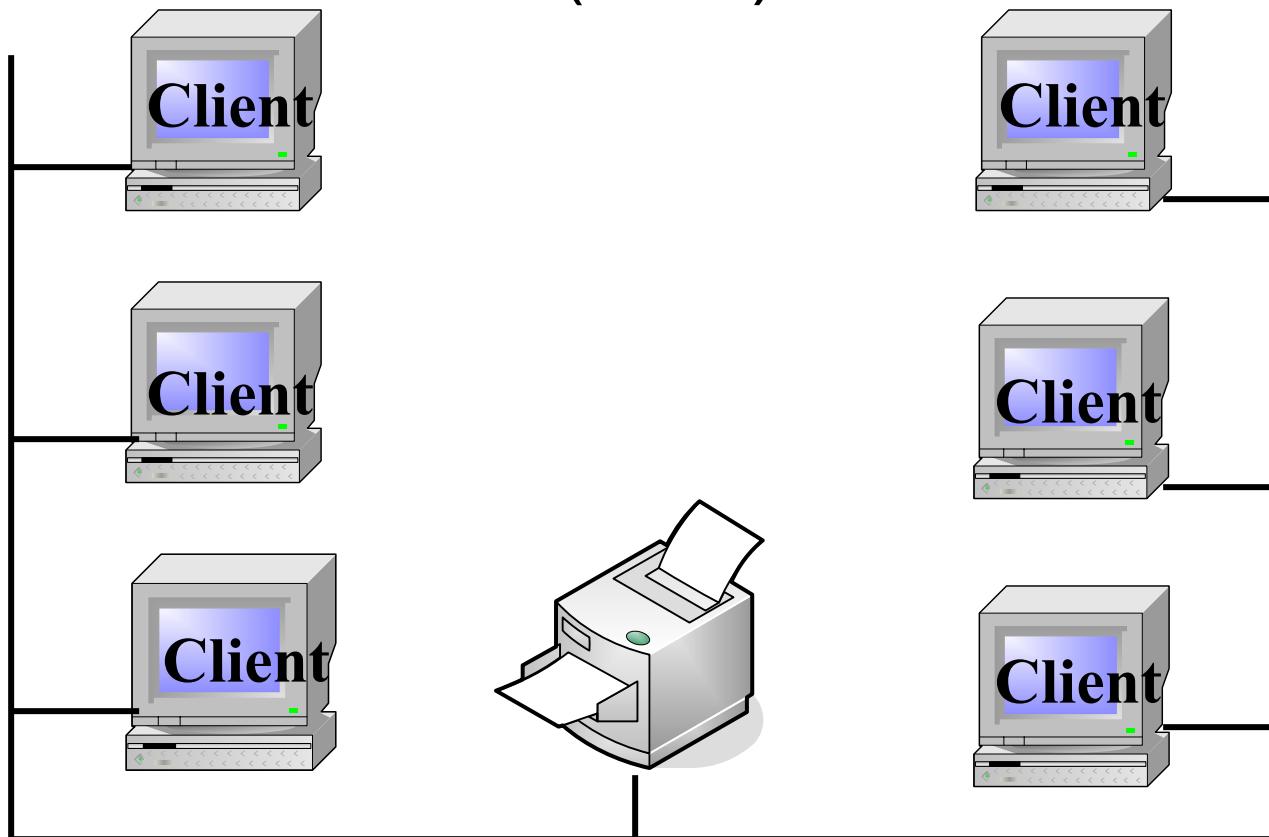


Types of Networks

- **Local-area network (LAN)** A network that connects a relatively small number of machines in a relatively close geographical area.
- LAN is usually privately owned and links the devices in a single office, building or campus of up to few kilometers in size.
- LANs are distinguished from other kinds of networks by three categories: their size, transmission technology and topology.

Local Area Network

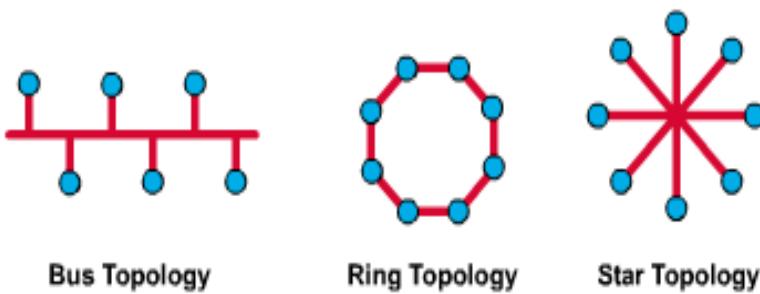
The Local Network (LAN)





Network Topology

- The network topology defines the way in which computers, printers, and other devices are connected.
- A network topology describes the layout of the wire and devices as well as the paths used by data transmissions.





Types of Networks

- Various configurations, called topologies, have been used to administer LANs
 - **Ring topology** A configuration that connects all nodes in a closed loop on which messages travel in one direction
 - **Star topology** A configuration that centers around one node to which all others are connected and through which all messages are sent
 - **Bus topology** All nodes are connected to a single communication line that carries messages in both directions



Types of Networks

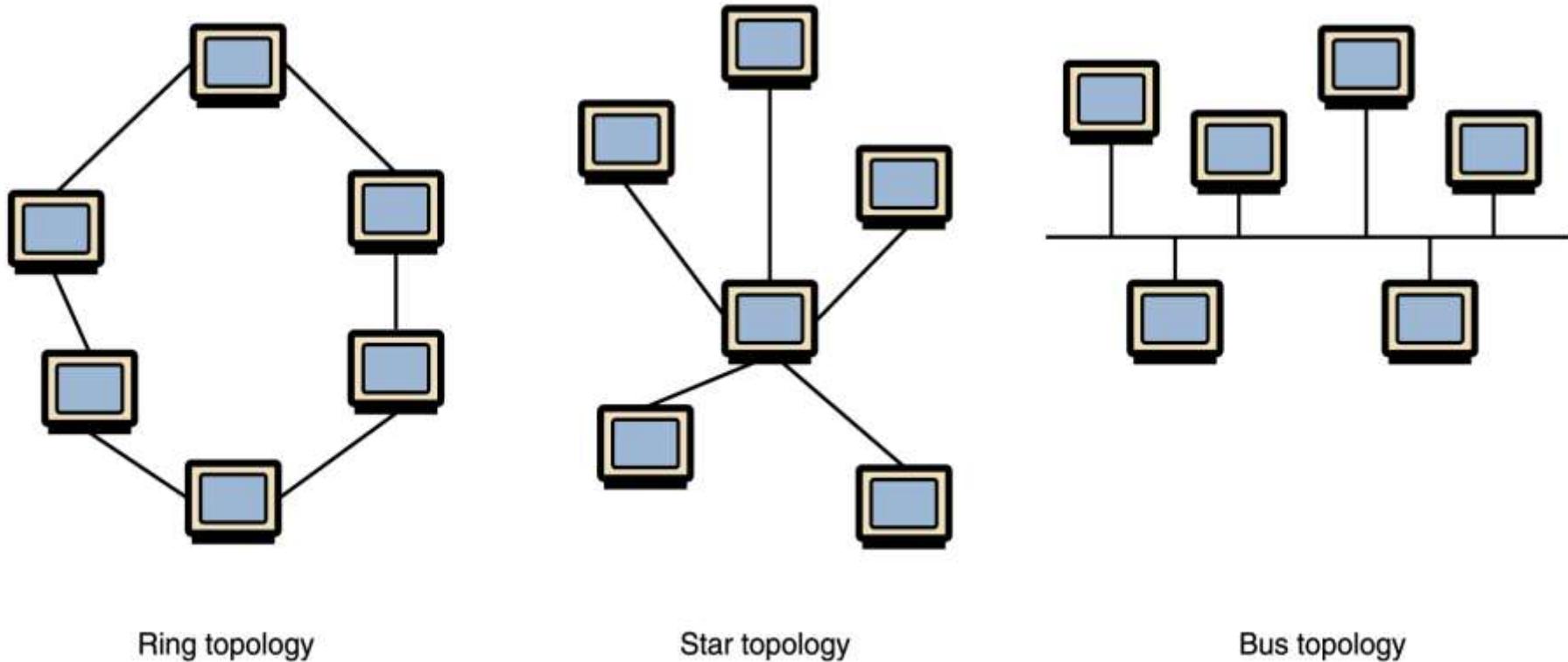


Figure 2 Various network topologies

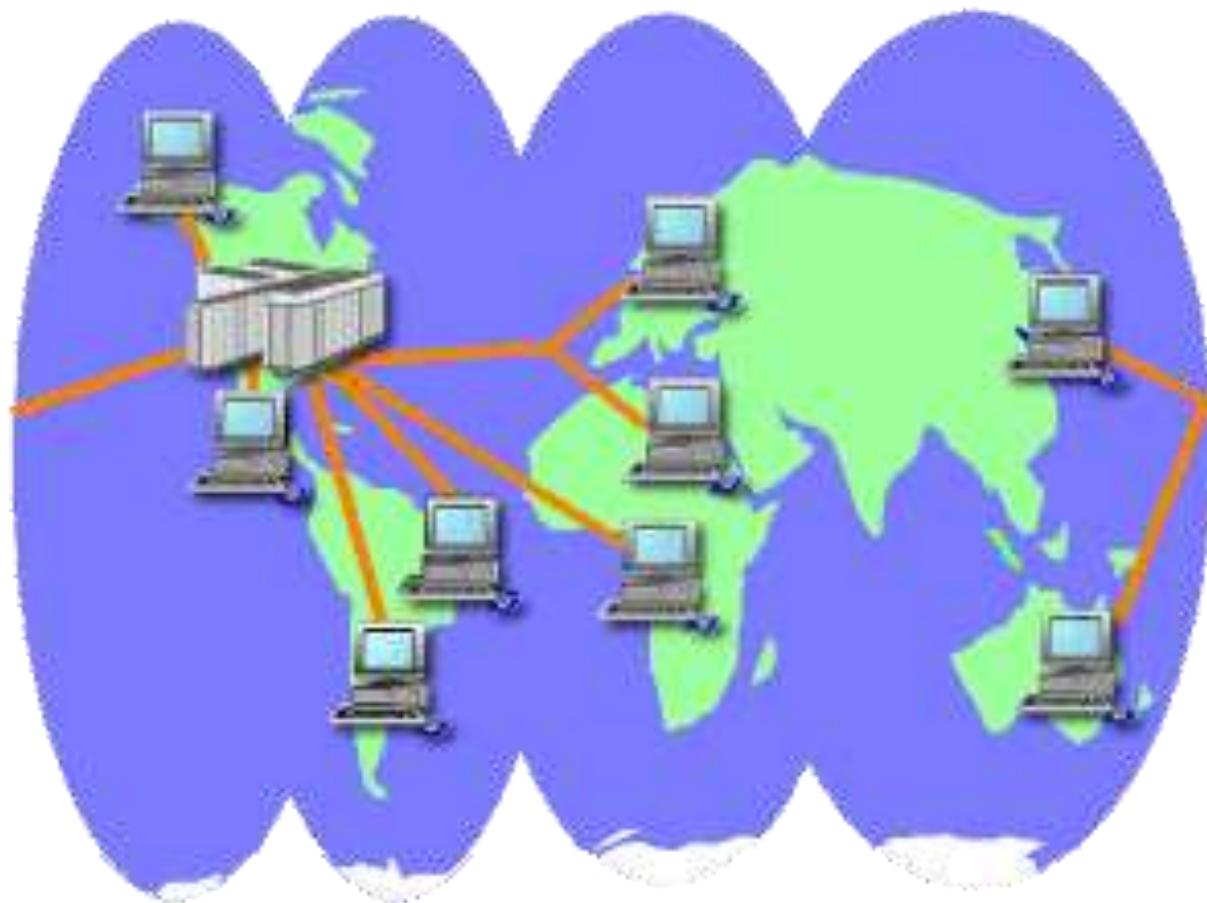
- A bus technology called **Ethernet** has become the industry standard for local-area networks



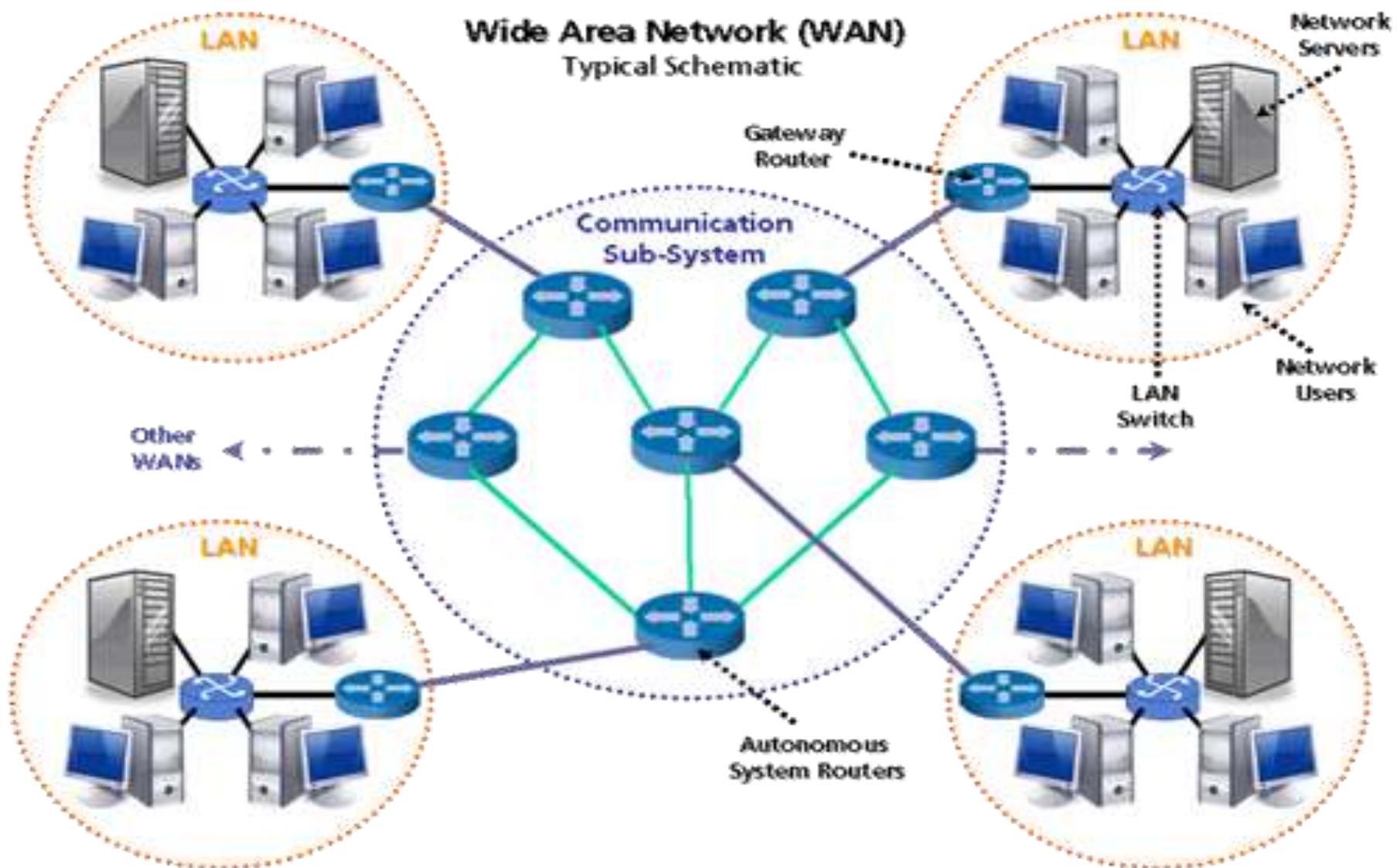
Types of Networks

- **Wide-area network (WAN)** A network that connects two or more local-area networks over a potentially large geographic distance
- This ensures that computers and users in one location can communicate with computers and users in other locations.
Often one particular node on a LAN is set up to serve as a **gateway** to handle all communication going between that LAN and other networks
- Communication between networks is called internetworking
The **Internet**, as we know it today, is essentially the ultimate wide-area network, spanning the entire globe

Wide Area Network Example 1



Wide Area Network Example 2



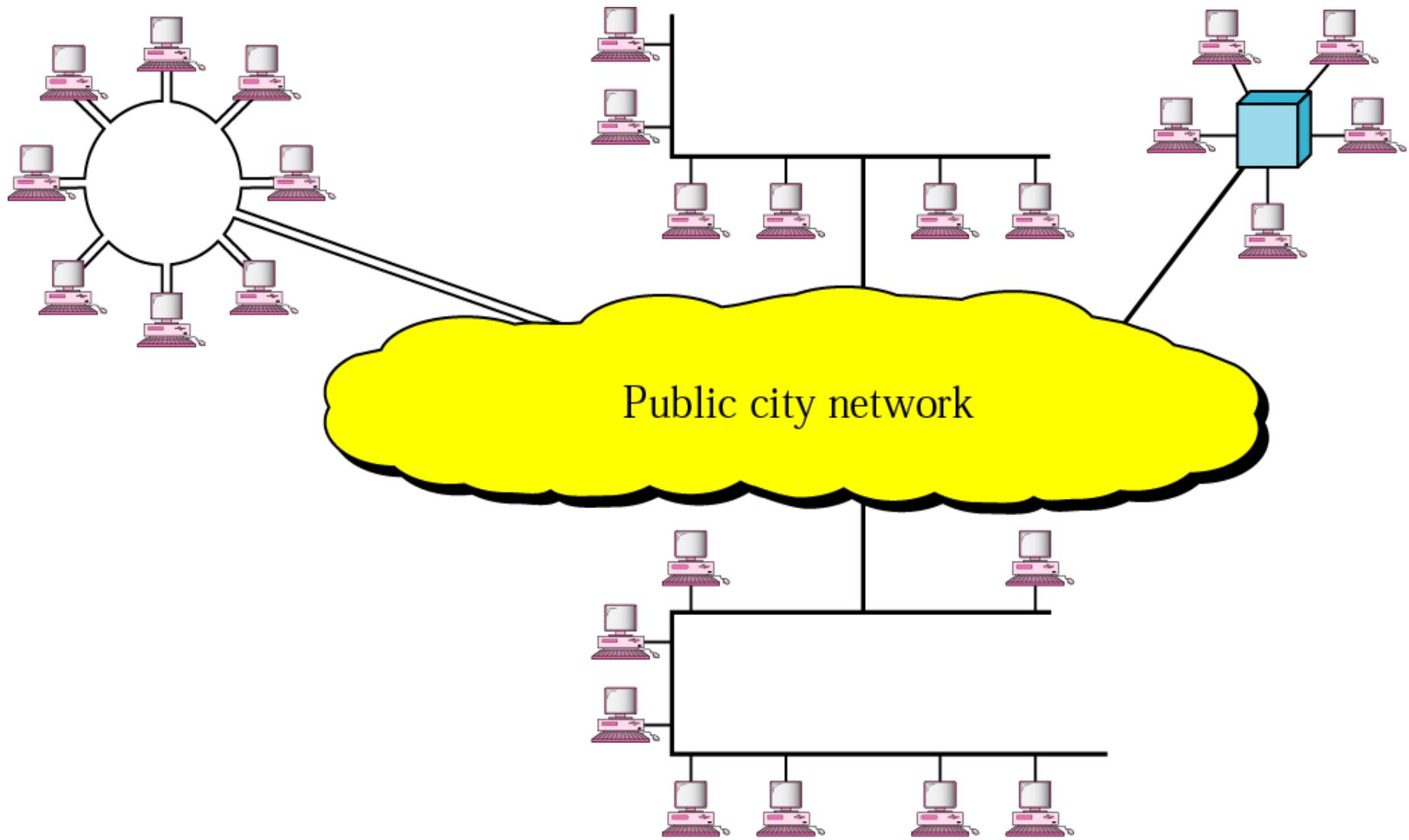


Types of Networks

- **Metropolitan-area network (MAN)** The communication infrastructures that have been developed in and around large cities

- *THE **NETWORK** CONNECTING DIFFERENT BRANCHES OF A COMPANY IN **SAME CITY**.*
- *THE NETWORK **CONNECTING** DIFFERENT CAMPUSES OF A COLLEGE IN A CITY.*
- ***CABLE TV** NETWORK IN A CITY.*

MAN





Myriads of New Computer Networking Technologies

Currently there are multiple networking technologies in use

- Local Area Network (LAN)
- Wide Area Network (WAN)
- Metropolitan Area Network (MAN)
- Wireless Local Area Network (WLAN)
- Storage Area Network (SAN)
- Controller Area Network (CAN)
- Personal Area Network (PAN)
- Global Area Network (GAN)
- Internet Area Network (IAN)



Protocols and Standards

- Protocols
- Standards
- Standards Organization



Protocol

- *is a formal set of rules and conventions that governs how computers exchange information over a network medium.*
- Protocol defines :
 - What is communicated?
 - How it communicated?
 - When it is communicated?



What's a protocol?

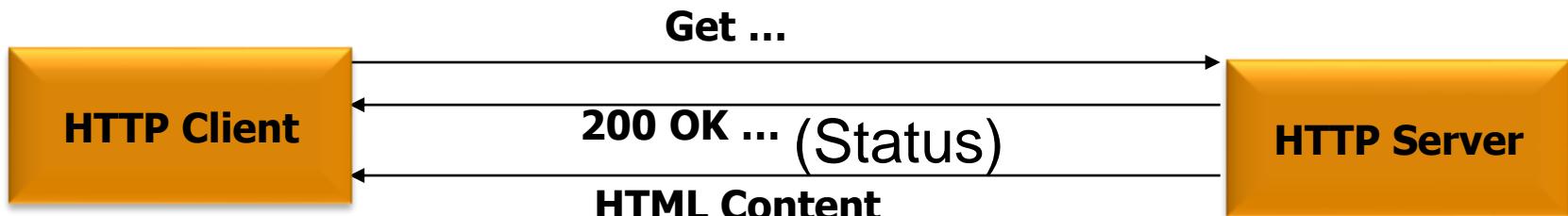
Network Protocols:

all communication activity in Internet governed by protocols

protocols define format, order of msgs sent and received among network entities, and actions taken on msg transmission and/or receipt of a msg.

HTTP EXAMPLE :

HTTP requesting application



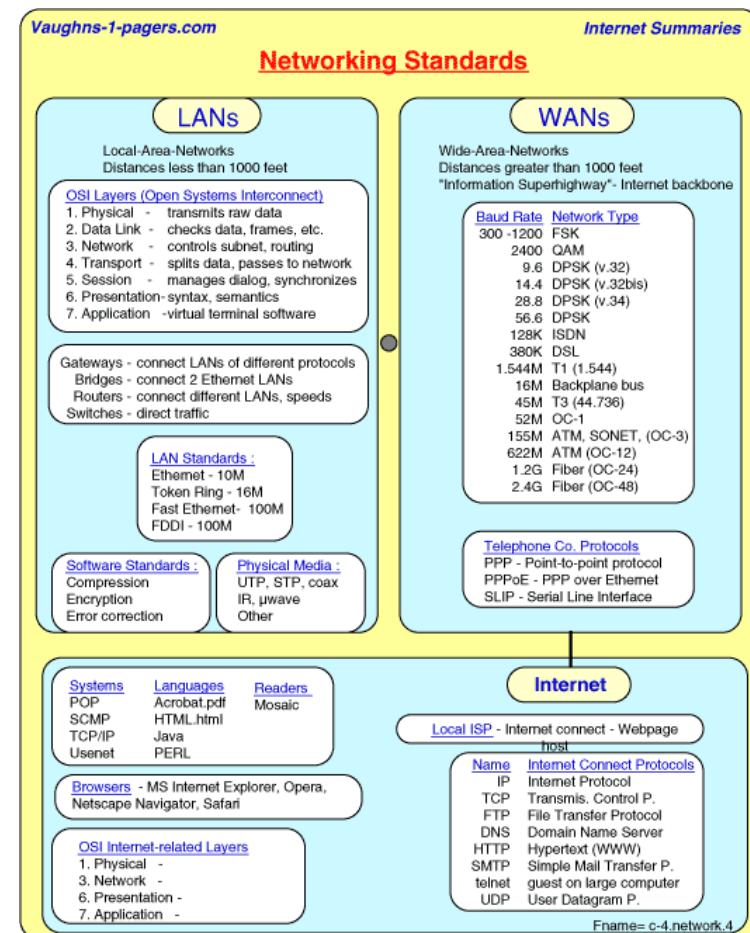
- Web browser runs an HTTP client program
- Web server runs an HTTP server program
- HTTP Protocol
 - HTTP client sends its request message to download the webpage: (**Get ...**message) which includes:
 - Server's IP address : 2.3
 - Filename : index.html
 - Host's IP address : 1.1
 - HTTP server sends a status response
 - HTTP server send HTML data content

Network Standards

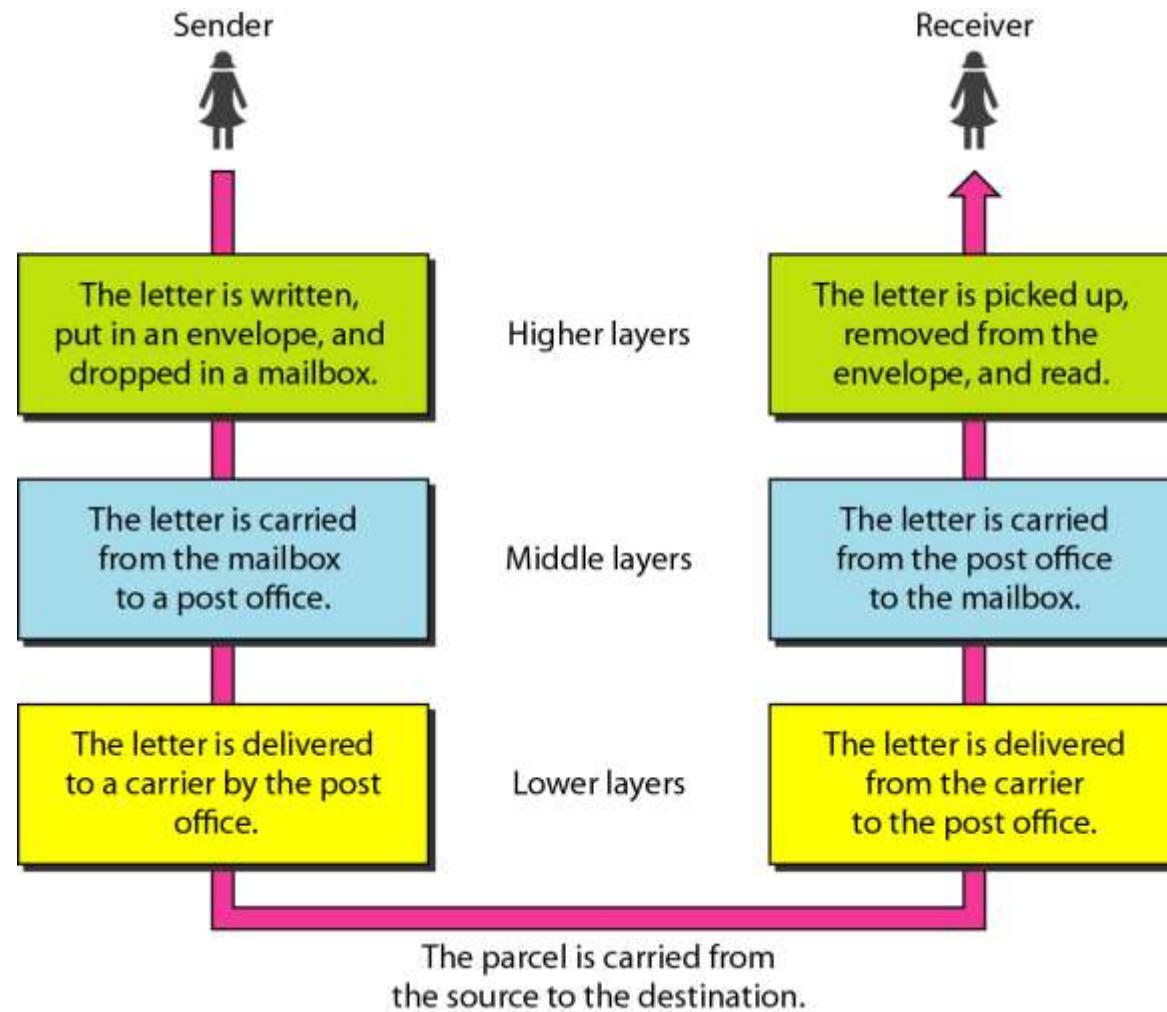
With the creation of huge computer networks, with many more devices being added to the chain each day,

- It becomes necessary to set up some standards that defined the way computers interact with each other and how data was transferred amongst them.

Standards and protocols provide the essential rules that enable hardware and software to work together in order to allow devices to communicate over a computer network.

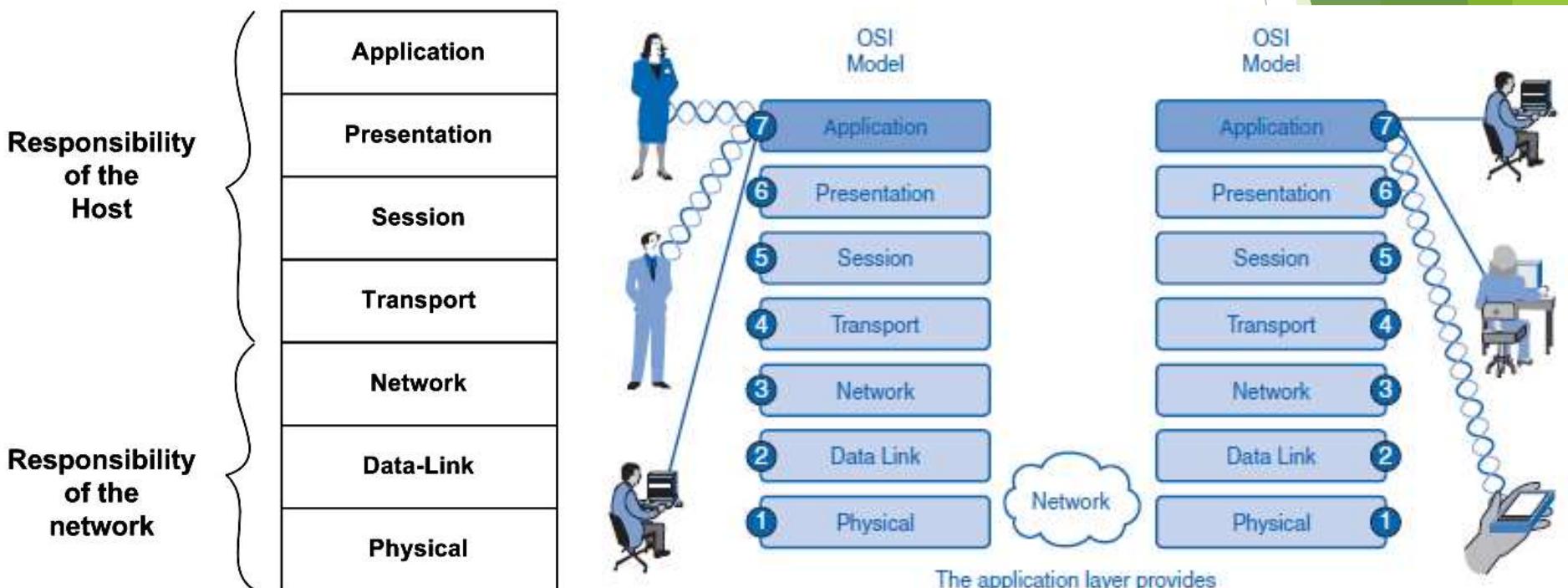


Layered Tasks, Example

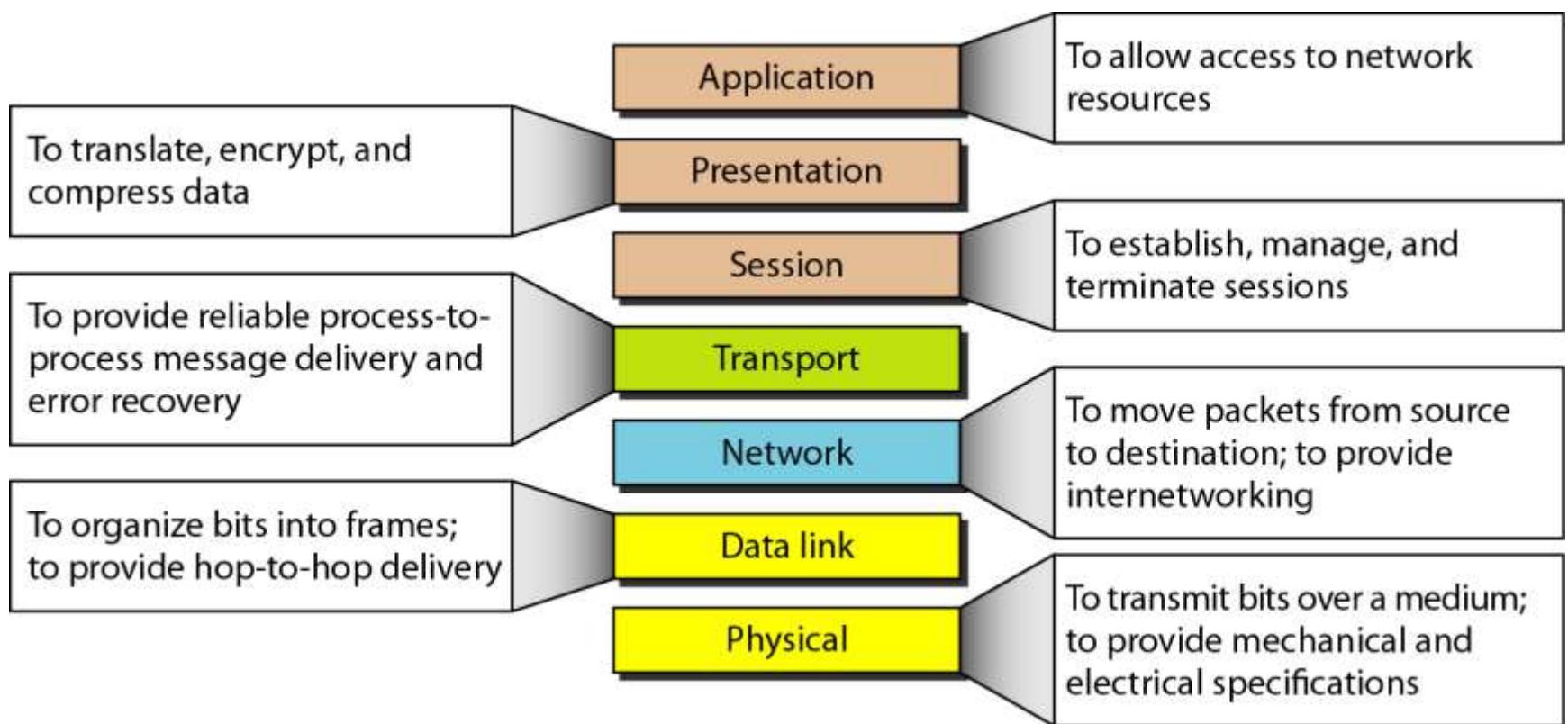


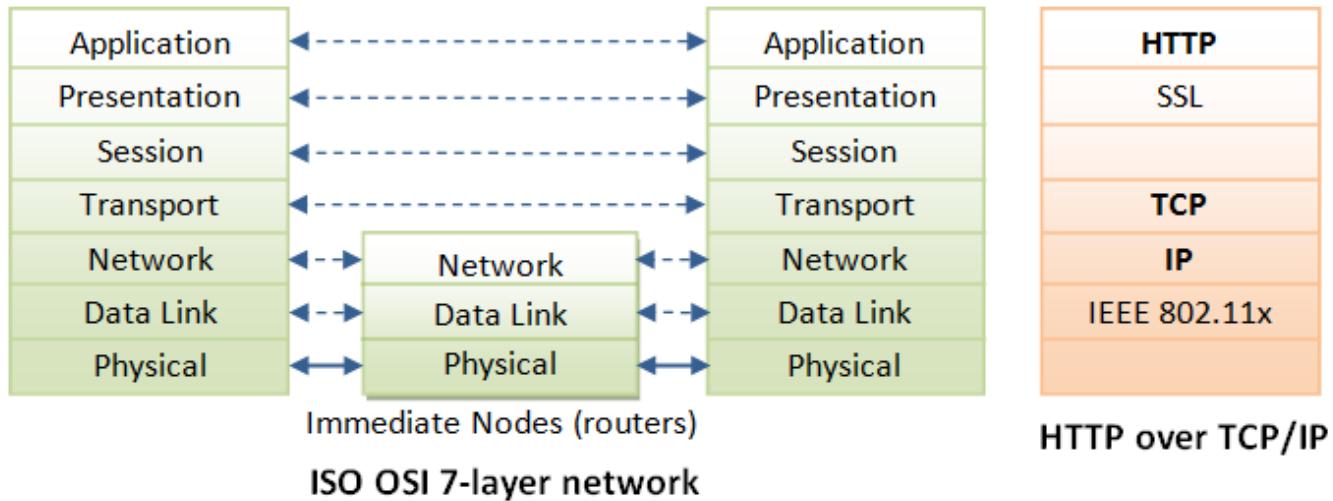
Open System Interconnection (OSI) Reference Model

- Developed by International Organization for Standardization (ISO) in 1984

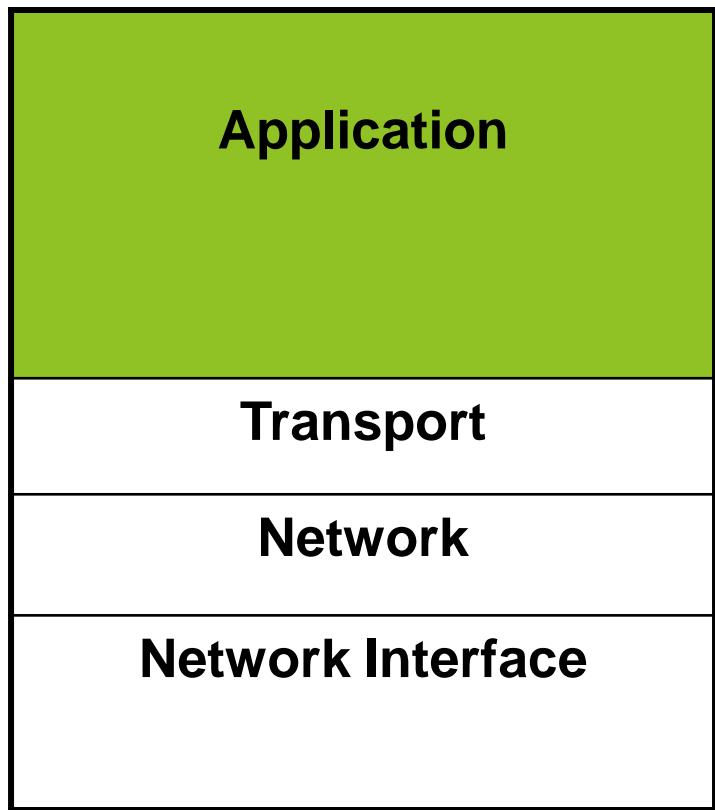


OSI MODEL

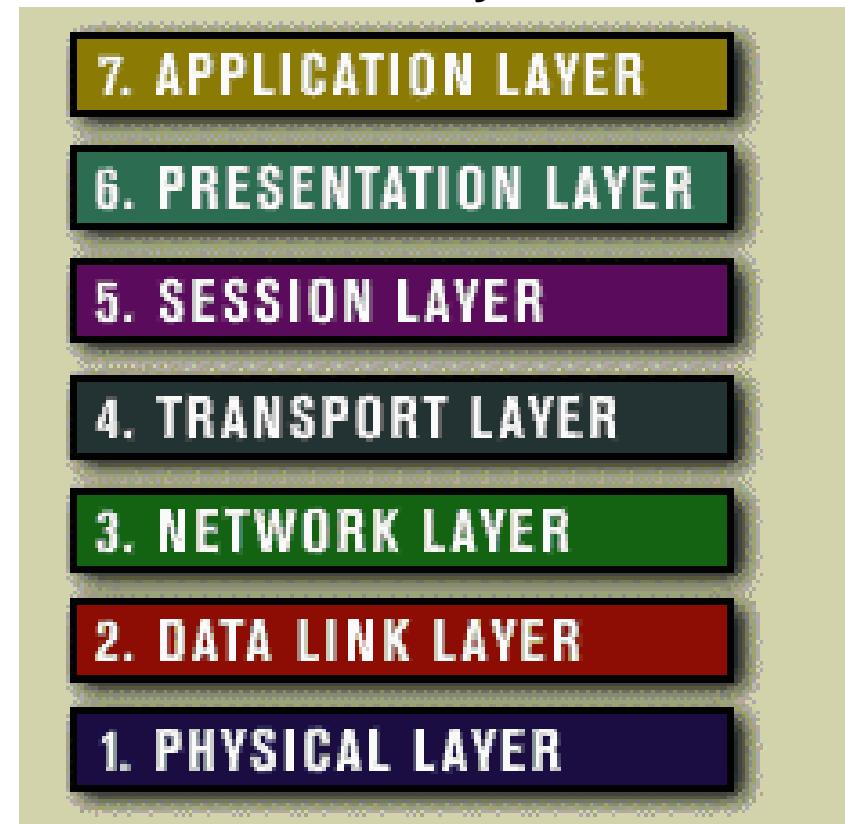




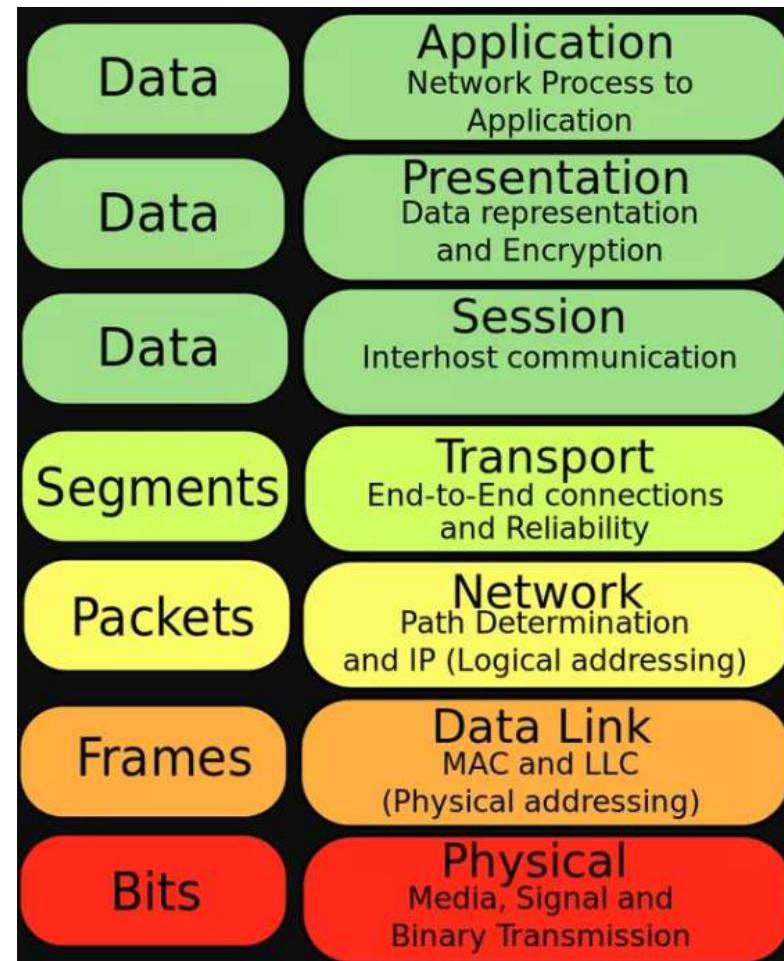
TCP/IP 4-layers



OSI 7-layers



Data and Layer





TCP/IP

- TCP stands for **Transmission Control Protocol**
TCP software breaks messages into packets, hands them off to the IP software for delivery, and then orders and reassembles the packets at their destination
- IP stands for **Internet Protocol**
IP software deals with the routing of packets through the maze of interconnected networks to their final destination



For Short

- **Transmission control protocol (TCP)** – A standard that defines how one computer can communicate and exchange data with another computer on the Internet.
- **Internet protocol (IP)** – Defines the Internet's addressing scheme.
- **IP address** – Each computer connected to the Internet is given an address composed of numbers and periods. Example: **209.234.156.8**



What is Internet?

- The internet is a network of computers linking many different types of computers all over the world.
- It is a very large **wide area network (WAN)** connecting computers and networks around the world.
- It makes it possible for millions of users to connect to one another via **telephone lines, cable lines and satellites**.



So, who owns the Internet?

Well, nobody does. No single person or company owns the Internet or even controls it entirely. As a wide-area network, it is made up of many smaller networks. These smaller networks are often owned and managed by a person or organization. The Internet, then, is really defined by how connections can be made between these networks.



Internet Connections

- **Internet backbone** A set of high-speed networks that carry Internet traffic

These networks are provided by companies such as AT&T, GTE, and IBM
- **Internet service provider (ISP)** A company that provides other companies or individuals with access to the Internet



internet service providers (ISPs)

- Hierarchical organization of the Internet includes:
 - **International Internet Service Providers**
 - **National Internet Service Providers**
 - **Regional Internet Service Providers**
 - **Local Internet Service Providers**



Internet Connections

- There are various technologies available that you can use to connect a home computer to the Internet
 - A **phone modem** converts computer data into an analog audio signal for transfer over a telephone line, and then a modem at the destination converts it back again into data
 - A **digital subscriber line (DSL)** uses regular copper phone lines to transfer digital data to and from the phone company's central office
 - A **cable modem** uses the same line that your cable TV signals come in on to transfer the data back and forth
 - **Wireless** or Wi-Fi, as the name suggests, does not use telephone lines or cables to connect to the internet.
 - **Satellite** accesses the internet via a satellite in Earth's orbit.
 - **Cellular** technology provides wireless Internet access through cell phones.



Domain Name

- Simplistically, a domain name is the address that you type into a website browser address bar, to get to a website.
- For example, the domain name for Google is <https://www.google.com>
- The domain name for this website is <https://www.websitebuilderexpert.com>
- A domain name is unique to your website (just like a fingerprint), and cannot be shared between different websites.



Network Addresses

- Network software translates a hostname into its corresponding IP address

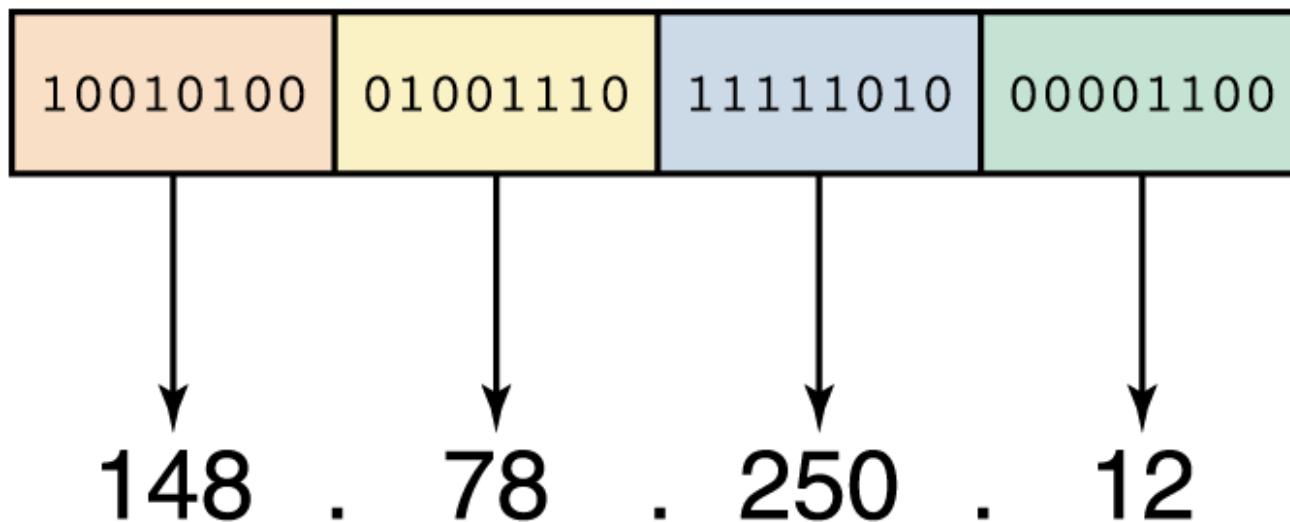
Host Name : www.hotmail.com

IP Address : 157.55.46.241 and 157.55.46.240

Location : United States (accuracy)

Network Addresses

- An **IP address** can be split into
 - **network address**, which specifies a specific network
 - **host number**, which specifies a particular machine in that network



148.78.250.0 - network address.

0.0.0.12 - host address.

Figure 15.9
An IP address is stored in four bytes



Domain Name System

- The **domain name system** (DNS) is chiefly used to translate hostnames into numeric IP addresses
 - DNS is an example of a distributed database
 - If that server can resolve the hostname, it does so
 - If not, that server asks another domain name server



Domain Name System

- The very last section of the domain is called its **top-level domain (TLD)** name

Top-Level Domain	General Purpose	New TLDs	General Purpose
.com	U.S. Commercial	.biz	Business
.net	Network	.info	Information
.org	Nonprofit organization	.pro	Professional
.edu	U.S. Educational	.museum	Museums
.int	International	.aero	Aerospace industry
.mil	U.S. Military	.coop	Cooperative
.gov	U.S. Government		

Figure 15.10 Top-level domains, including some relatively new ones



Domain Name System

- Organizations based in countries other than the United States use a top-level domain that corresponds to their two-letter country codes

Country Code TLD	Country
.au	Australia
.br	Brazil
.ca	Canada
.gr	Greece
.in	India
.ru	Russian Federation
.uk	United Kingdom

Figure 15.11
Some of the top-level domain names based on country codes

→ What is a Web Browser?



- ❖ Web browsers are **computer software programs that access and display content from Internet websites.**



- ❖ Browsers interpret Web programming code and present it in a way that is easy to view and (in most cases) support user interactions.
- ❖ Information on the Web can be stored and accessed from many different physical locations around the World.
- ❖ How each browser interprets, displays and interacts with web sites is (usually) different.

Introduction to HTML

HTML: HyperText Markup Language

- HTML documents are simply text documents with a specific form
 - Documents comprised of **content** and **markup tags**
 - Content: actual information being conveyed
 - The markup tags tell the Web browser **how to display** the page
 - An HTML file must have an **htm** or **html** file extension
 - An HTML file can be created using a **simple text editor**

Our First Example

- If you are running Windows, start Notepad
- If you are on a Mac, start SimpleText
- Type in the following:

```
<html>
<head>
<title>Trial Page</title>
</head>
<body>
This is my first homepage. <b>This text is bold</b>
</body>
</html>
```

- Open this file using a browser, and you will see...

HTML Tags

- HTML tags are used to mark-up HTML elements
 - Surrounded by angle brackets < and >
 - HTML tags normally come in pairs, like <tagname> (start tag) and </tagname> (end tag)
 - The text between the start and end tags is the element content
 - Not case-sensitive
 - Follow the latest web standards:
 - Use lowercase tags

Tag Attributes

- Tags can have attributes that provide additional information to an HTML element
 - Attributes always come in name/value pairs like: `name="value"`
 - Attributes are always specified in the start tag
 - Attribute values should always be enclosed in quotes. Double quotes are most common.
 - Also case-insensitive: however, lowercase is recommended
 - `<tagname a1="v1" a2="v2"></tagname>`
 - For example, `<table border="0">` is a start tag that defines a table that has no borders

HTML Document Structure

- Entire document enclosed within `<html>` and `</html>` tags
- Two subparts:
 - Head
 - Enclosed within `<head>` and `</head>`
 - Within the head, more tags can be used to specify title of the page, meta-information, etc.
 - Body
 - Enclosed within `<body>` and `</body>`
 - Within the body, content is to be displayed
 - Other tags can be embedded in the body

Content of section **HEAD**: META tags

- **META** tags are elements of HEAD
- META tags are very important and useful instrument because you can advertise your site, so that the search indexes can find it among the huge amount of information in Internet.
- Meta tags are two groups:
- META tags, including the attribute **HTTP-EQUIV** and the attribute **CONTENT**. These Meta tags have the following format:

```
<meta http-equiv="name" content="content" />
```

META tags with attributes HTTP-EQUIV are used for managing the action of the browsers.

```
< meta http-equiv ="Content-Type" content ="text/html; charset=windows-1251">
```

Sample Structure of a Web Site

```
<HTML>
```

```
    <HEAD>
```

```
        <TITLE>OZI's Web Page </TITLE>
```

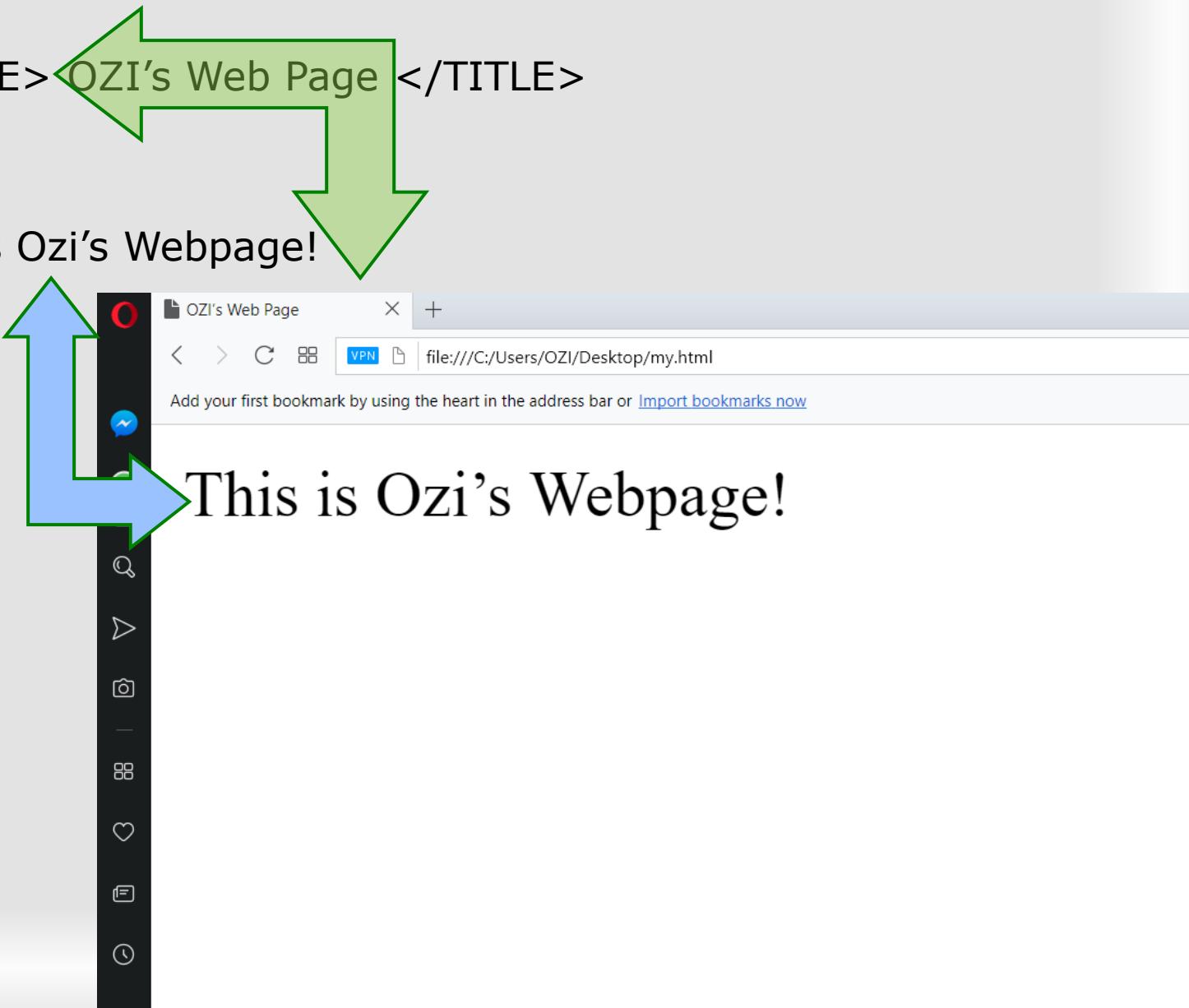
```
    </HEAD>
```

```
    <BODY>
```

```
        This is Ozi's Webpage!
```

```
    </BODY>
```

```
</HTML>
```



We'll Study...

- HTML Basics
 - HTML Elements
 - HTML Headings
 - HTML Paragraphs
 - HTML Formatting
 - HTML Styles
 - HTML Images
 - HTML Tables
 - HTML Lists
 - HTML Forms
 - HTML Colors

Header Tags

Header Tags -- Used for marking sections and subsections in a document.

<H1>Header 1 -- Giant-sized and bold </H1>

<H2>Header 2 -- Large and bold </H2>

<H3>Header 3 -- Normal-sized and bold </H3>

<H4>Header 4 -- Small and bold </H4>

<H5>Header 5 -- Very Small and bold </H5>

<H6>Header 6 -- Tiny and bold </H6>

<HTML>

<HEAD><TITLE> OZI's Web Page </TITLE>

</HEAD>

<BODY>

<h1>This is heading H1</h1>

<h2>This is heading H2</h2>

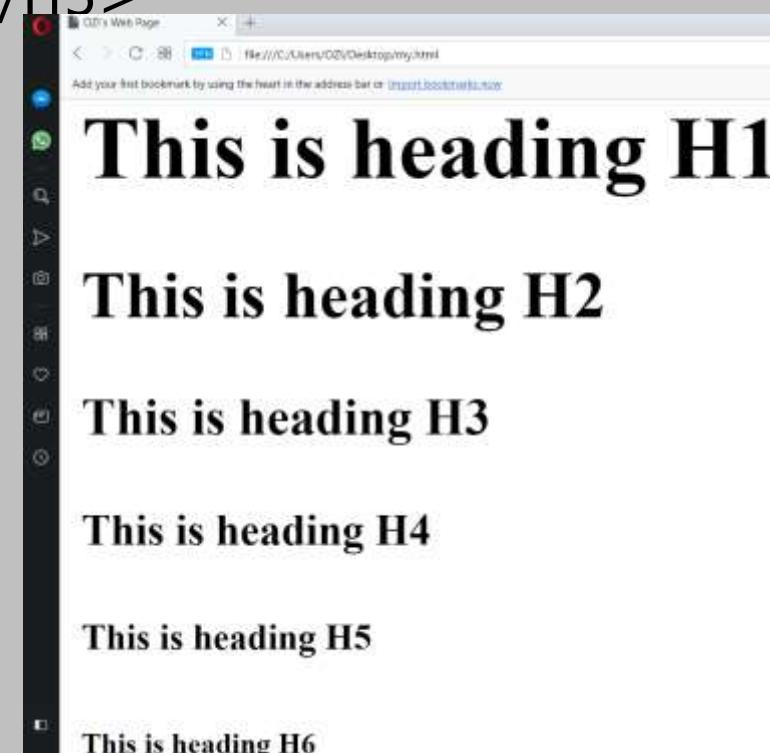
<h3>This is heading H3</h3>

<h4>This is heading H4</h4>

<h5>This is heading H5</h5>

<h6>This is heading H6</h6>

</BODY></HTML>

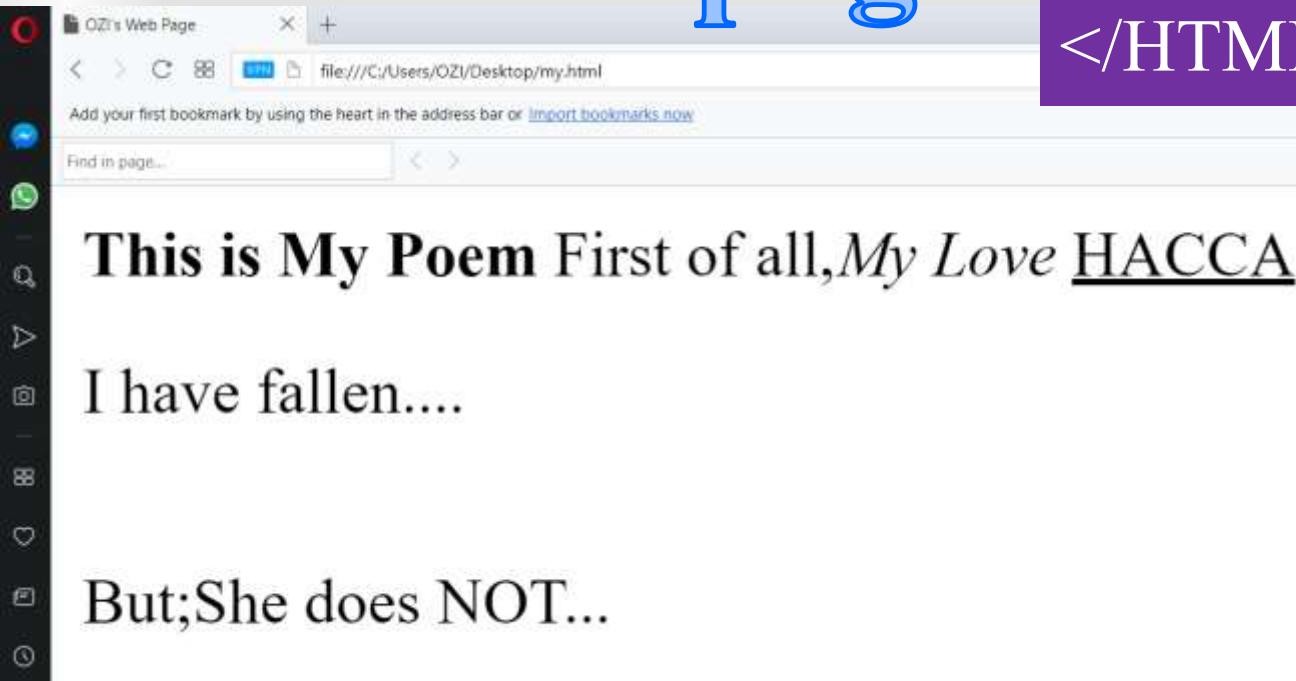


Text Formatting Tags

 Bold Face
<I> *Italics* </I>
<U> Underline </U>
<P> New Paragraph </P>

 Next Line

This is Webpage



```
<HTML>
<BODY>
<b>This is My Poem</b>
First of all,<i>My Love</i>
<u>HACCA</u>
<p>I have fallen....</p>
<br>But;She does NOT...
</BODY>
</HTML>
```

Text Formatting Tags

Some basic text formatting styles:

The screenshot shows a web browser window titled "OZI's Web Page". The address bar displays "file:///C/Users/OZI/Desktop/my.html". The page content includes a pre-tagged section with "MY Dreams" and "For My thoughts", followed by three ellipses. Below this is a horizontal line. The page then lists three h2 tags: "Big Person", "big Doctor", and four more ellipses. A large blue rectangular box highlights the HTML code for the page content.

```
<BODY>
<pre>MY Dreams
    For My thoughts
    ...
</pre>
<hr size="5" align="center" width="250">
<h2>Big Person</h2>
<h2>big Doctor</h2>
<h2>.....</h2>
</BODY>
```

Tag

The attributes of are: face, size and color.

The type, size and color of the font is determined by the code:

Here is written the text

The text is written here

This is blue text

Text written by “arial” font with different size is the following:

This is text with size 1

This is text with size 2

This is text with size 3

This is text with size 4

This is text with size 5

This is text with size 6

This is text with size 7

Color Codes

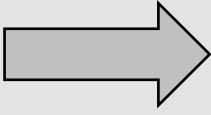
1. WHITE
2. BLACK
3. RED
4. GREEN
5. BLUE
6. MAGENTA
7. CYAN
8. YELLOW
9. AQUAMARINE
10. BAKER'S CHOCOLATE
11. VIOLET
12. BRASS
13. COPPER
14. PINK
15. ORANGE

1. #FFFFFF
2. #000000
3. #FF0000
4. #00FF00
5. #0000FF
6. #FF00FF
7. #00FFFF
8. #FFFF00
9. #70DB93
10. #5C3317
11. #9F5F9F
12. #B5A642
13. #B87333
14. #FF6EC7
15. #FF7F00

Lists -- Unordered Lists

Unordered lists:

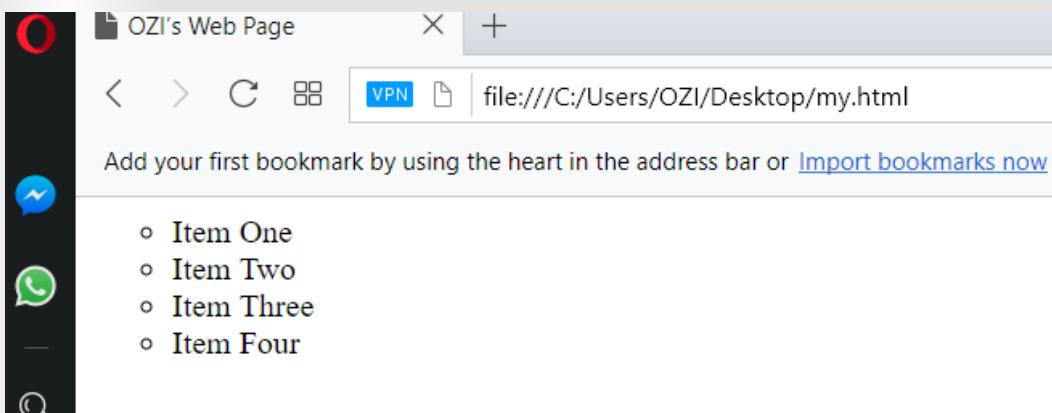
```
<ul>
  <li>Item One</li>
  <li>Item Two</li>
  <li>Item Three</li>
  <li>Item Four</li>
</ul>
```

- 
- Item One
 - Item Two
 - Item Three
 - Item Four

Unordered List Attributes:

type="disc/circle/square"

- Disc (default) Circle Square



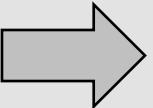
```
<ul type="circle">
  <li>Item One</li>
  <li>Item Two</li>
  <li>Item Three</li>
  <li>Item Four</li>
</ul>
```

Lists -- Ordered Lists

Ordered (Numbered) Lists:

```
<ol>
```

```
  <li>Item One  </li>
  <li>Item Two  </li>
  <li>Item Three </li>
  <li>Item Four  </li>
```



```
    1. Item One
    2. Item Two
    3. Item Three
    4. Item Four
```

```
<ol type="A">
```

```
  <li>Item One</li>
  <li>Item Two</li>
  <li>Item Three</li>
  <li>Item Four</li>
```

```
</ol>
```

- A. Item One
- B. Item Two
- C. Item Three
- D. Item Four

Ordered List Attributes:

type="i/I/a/A/l"

(default)

i = i. Item One

I = I. Item One

a = a. Item One

A = A. Item One

l = 1. Item One

ii. Item Two

II. Item Two

b. Item Two

B. Item Two

2. Item Two

iii. Item Three

III. Item Three

c. Item Three

C. Item Three

3. Item Three

iv. Item Four

IV. Item Four

d. Item Four

D. Item Four

4. Item Four

start="xx"

- This attribute lets you specify which number/letter will start the list

- 3. Item One
- 4. Item Two
- 5. Item Three
- 6. Item Four

```
<ol type="1" start="3">
  <li>Item One</li>
  <li>Item Two</li>
  <li>Item Three</li>
  <li>Item Four</li>
</ol>
```

List Elements

TYPE	Numbering Styles	
1	Arabic numbers	1,2,3,
a	Lower alpha	a, b, c,
A	Upper alpha	A, B, C,
i	Lower roman	i, ii, iii,
I	Upper roman	I, II, III,

Lists – Definition Lists

DL: Definition List. This kind of list is different from the others.

Each item in a DL consists of one or more **Definition Terms (DT elements)**, followed by one or more **Definition Description (DD elements)**.

```
<DL>
<DT> HTML </DT>
<DD> Hyper Text Markup Language </DD>
<DT> DOG </DT>
<DD> A human's best friend!</DD>
</DL>
```

HTML

Hyper Text Markup Language

DOG

A human's best friend!

```
<ul type="disc">
  <li>Mornings</li>
<ul type="circle">
  <li>Hot Dishes</li>
<ul type="square">
  <li>omelet</li><li>waffles</li>
  <ul type="square">
    <li>Country style</li><li>Belgian</li>
  </ul>
  <li>toast</li>
</ul>
<li>Cold Dishes</li>
<ul type="square">
  <li>WATERMELON</li>
  <li>CHICKEN ORZO SALAD</li>
  <li>MEXICAN SHRIM</li>
</ul> </ul> </ul>
```

C. The History of GORILLA
V. Early History
 3. FOSSIL
 2. FUEL
 1. TREE
VI. MAYAN
VII. KWORLD
D. Future Use of GORILLA

- Mornings
 - Hot Dishes
 - omelet
 - waffles
 - Country style
 - Belgian
 - toast
 - Cold Dishes
 - WATERMELON
 - CHICKEN ORZO SALAD
 - MEXICAN SHRIM

```
<ol type="A" start="3">
  <li>The History of GORILLA</li>
<ol type="I" start="5">
  <li>Early History</li>
<ol type="1" reversed>
  <li>FOSSIL</li><li>FUEL</li><li>TREE</li>
</ol>
  <li>MAYAN</li> <li>KWORLD</li>
</ol>
  <li>Future Use of GORILLA</li>
</ol>
```

Hyperlink

- Link to another location or file
- Syntax:

```
<a href= "http://www. msu.edu"> Link to MSU </a>
```

Content displayed on the page

Starting Tag

Attribute of the tag: the address of the hyperlink

Ending tag

[Link to MSU"](http://www. msu.edu)

Link

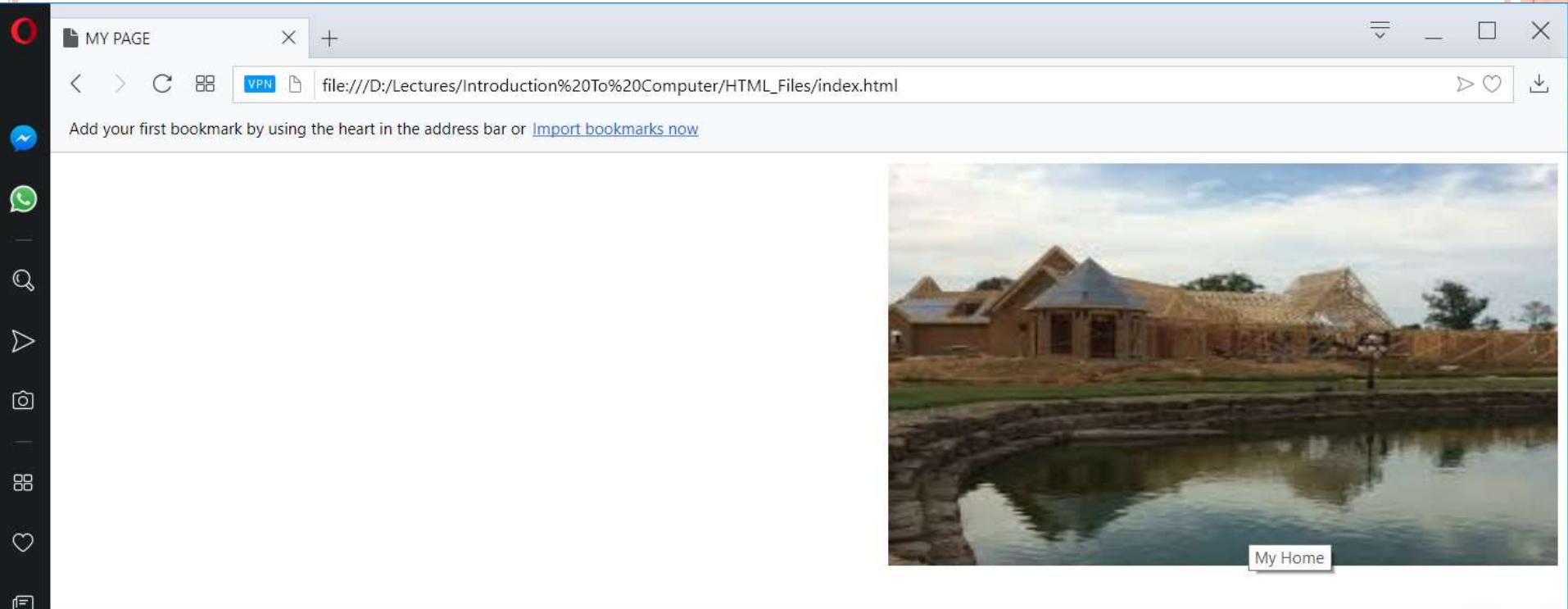
- Link to web site
 - <[a href= “http://www.ucf.edu”> Link to UCF](http://www.ucf.edu)
- Link to document
<[a href=“http://www.eecs.ucf.edu/images/building.jpg”>Link](http://www.eecs.ucf.edu/images/building.jpg)
- Email link
<[a href= “mailto:name@domain.com”> Link to email](mailto:name@domain.com)

The HTML **** tag is used for embedding images into an HTML document.

Attribute	Description
alt	Alternate text. This specifies text to be used in case the browser/user agent can't render the image.
src	Location of the image.
width	Specifies the width of the image.
height	Specifies the height of the image.

```

```



TABLE

- Graphical tables are enclosed within a two-sided **<table>** tag that identifies the start and ending of the table structure.
- Each row of the table is indicated using a two-sided **<tr>** (for table row).
- Within each table row, a two-sided **<td>** (for table data) tag indicates the presence of individual table cells.

The General Table Syntax

```
<table>
  <tr>
    <td> First Cell </td>
    <td> Second Cell </td>
  </tr>
  <tr>
    <td> Third Cell </td>
    <td> Fourth Cell </td>
  </tr>
</table>
```

two rows {

A diagram of a 2x2 table. It consists of four cells arranged in a grid. The top-left cell contains "First Cell", the top-right cell contains "Second Cell", the bottom-left cell contains "Third Cell", and the bottom-right cell contains "Fourth Cell". A red brace on the left side groups the first two rows together, and a red brace at the bottom groups the first two columns together.

First Cell	Second Cell
Third Cell	Fourth Cell

two columns

Adding a Table Border

- The syntax for creating a table border is: `<table border="value">`
 - value* is the width of the border in pixels

```
<table>
<tr><td>Name</td><td>Surname</td><td>Stu-Num</td></tr>
<tr><td>OZI</td><td>MOZI</td><td>123</td>
<tr><td>SEDA</td><td>KUSCU</td><td>321</td>
</tr>
```

`<table>`

Name	Surname	Stu-Num
OZI	MOZI	123
SEDA	KUSCU	321

`<table border=1>`

Name	Surname	Stu-Num
OZI	MOZI	123
SEDA	KUSCU	321

`<table border=5>`

Name	Surname	Stu-Num
OZI	MOZI	123
SEDA	KUSCU	321

Controlling Cell Spacing and Cell Padding

- The **cellspacing** attribute controls the amount of space inserted between table cells.
- To control the space between the table text and the cell borders, add the **cellpadding** attribute to the table tag.

```
<table cellspacing="value">
```

```
<table cellpadding="value">
```

```
<table border=1>
```

```
<tr><td>Name</td><td>Surname</td><td>Stu-Num</td></tr>
```

```
<tr><td>OZI</td><td>MOZI</td><td>123</td>
```

```
<tr><td>SEDA</td><td>KUSCU</td><td>321</td>
```

```
</tr>
```

Name	Surname	Stu-Num
OZI	MOZI	123
SEDA	KUSCU	321

```
<table border=1 cellspacing="5">
```

Name	Surname	Stu-Num
OZI	MOZI	123
SEDA	KUSCU	321

```
<table border=1 cellpadding="10">
```

Name	Surname	Stu-Num
OZI	MOZI	123
SEDA	KUSCU	321

<td> Attributes:

colspan = “x” : Forces the cell to cover “x” number of columns. Default = 1.

E.G. `<td colspan = “3”> . . . </td>`

rowspan = “y” : Forces the cell to cover “y” number of rows. Default = 1.

valign = “top”, “middle”, or “bottom” : Sets vertical alignment in the cell.

E.G. `<td valign = “top”> . . . </td>`

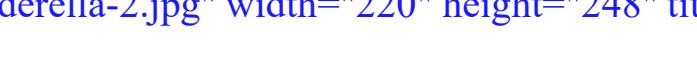
align = “left”, “center”, or “right” : Sets horizontal alignment in the cell.

- The cells in the **first rows** span across three columns to indicate the header for each story of names.
- This table is **900 pixel width** and **400 pixel height**.
- Display text on image when the cursor is hovered over it.

Verticle alignment:
bottom
baseline
middle

Color:
CC0000
0033CC
666699

Story Title		
Little Red Riding Hood	The Tale of Peter Rabbit	Cinderella
Once upon a time there was a dear little girl who was loved by every one who looked at her, but most of all by her grandmother, and there was nothing that she would not have given to the child. Once she gave her a little cap of red velvet, which suited her so well that she would never wear anything else. So she was always called Little Red Riding Hood.	ONCE upon a time there were four little Rabbits, and their names were— Flopsy, Mopsy, Cotton-tail, and Peter. They lived with their Mother in a sand-bank, underneath the root of a very big fir tree. "NOW, my dears," said old Mrs. Rabbit one morning, "you may go into the fields or down the lane, but don't go into Mr. McGregor's garden: your Father had an accident there: he was put in a pie by Mrs. McGregor."	ONCE there was a gentleman who married, for his second wife, the proudest and most haughty woman that was ever seen. She had, by a former husband, two daughters of her own humor, who were, indeed, exactly like her in all things. He had likewise, by another wife, a young daughter, but of unparalleled goodness and sweetness of temper, which she took from her mother, who was the best creature in the world.

<h1>Short Stories for Children</h1>		
<h2>Short Stories for Children</h2>		
<h3>Little Red Riding Hood</h3>		
<h3>The Tale of Peter Rabbit</h3>	<h3>Cinderella</h3>	
<p>Once upon a time there was a dear little girl who was loved by every one who looked at her, but most of all by her grandmother, and there was nothing that she would not have given to the child. Once she gave her a little cap of red velvet, which suited her so well that she would never wear anything else. So she was always called Little Red Riding Hood.</p>		
<p>ONCE upon a time there were four little Rabbits, and their names were— Flopsy, Mopsy, Cotton-tail, and Peter. They lived with their Mother in a sand-bank, underneath the root of a very big fir tree. "NOW, my dears," said old Mrs. Rabbit one morning, "you may go into the fields or down the lane, but don't go into Mr. McGregor's garden: your Father had an accident there; he was put in a pie by Mrs. McGregor."</p>		
<p>ONCE there was a gentleman who married, for his second wife, the proudest and most haughty woman that was ever seen. She had, by a former husband, two daughters of her own humor, who were, indeed, exactly like her in all things. He had likewise, by another wife, a young daughter, but of unparalleled goodness and sweetness of temper, which she took from her mother, who was the best creature in the world.</p>		
		
<p>Little Red Riding Hood</p>		
<p>The Tale of Peter Rabbit</p>		
<p>Cinderella</p>		

Question for mid-term exam

- Design the given table in HTML codes.
- You must use only the tags including the “
- You must use only the attributes of the “
- For the table,
 - Set the width and the height to 500 pixels.
 - Set the border to 2 and Center the table.
 - Set space between cells to 5.

The diagram illustrates three different ways to structure a table with 5 cells, labeled 1 through 5, to demonstrate various HTML table configurations:

- Version 1:** A single row with 5 cells. Cell 1 spans the first two columns, cell 3 is in the third column, and cells 4 and 5 are in the last two columns respectively.
- Version 2:** A two-row table. The top row contains cells 1 and 3. The bottom row contains cells 4 and 5.
- Version 3:** A three-row table. The first row contains cell 1. The second row contains cells 1 and 2. The third row contains cells 3, 4, and 5.

```
<body>
<table border="2" width="500" height="500" cellspacing="5" align="center">

<tr>
    <td rowspan="2" colspan="2">1</td><td rowspan="2">3</td><td colspan="2">4</td>
</tr>

<tr>
    <td>4</td><td>5</td>
</tr>

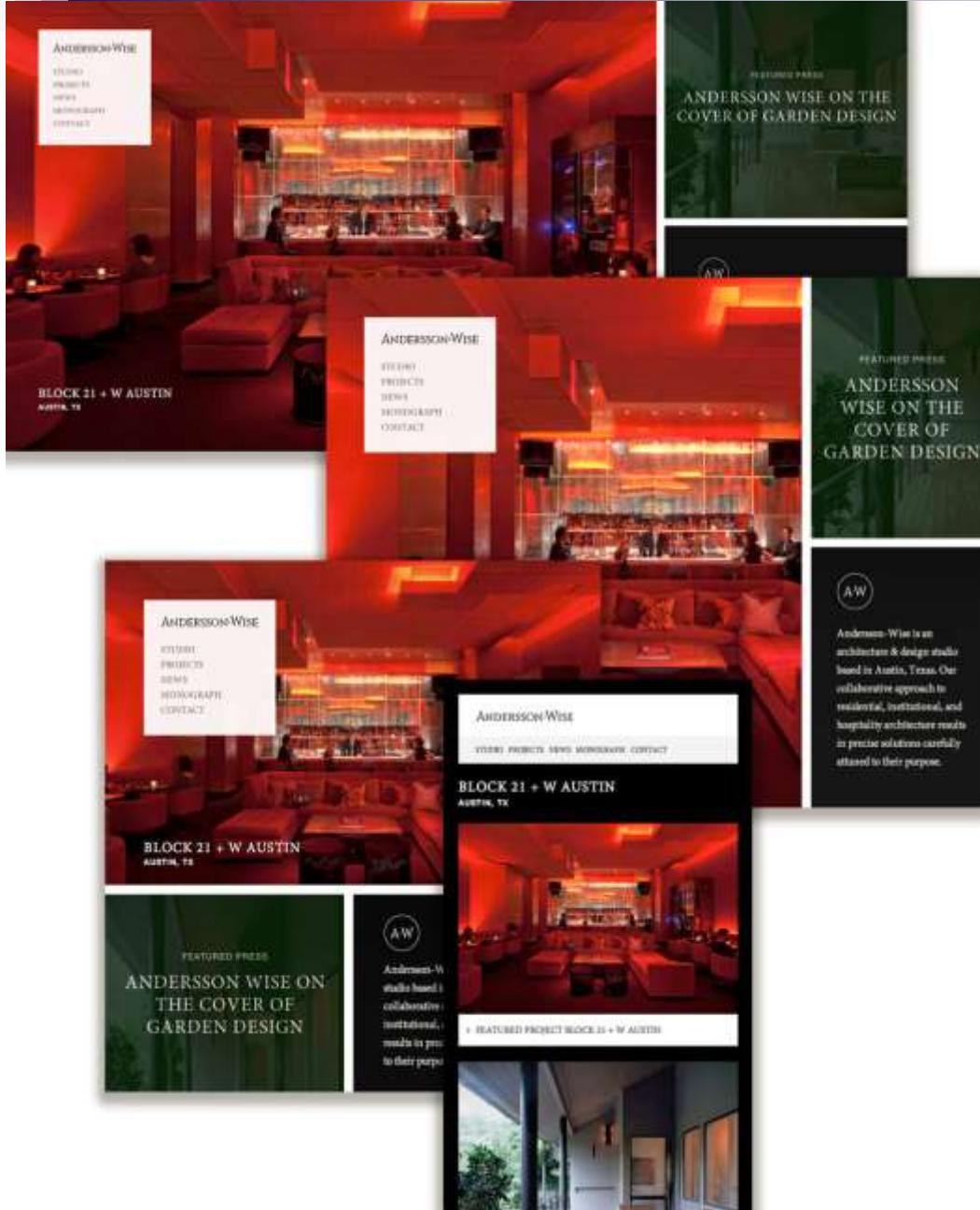
<tr>
    <td colspan="5">1</td>
</tr>

<tr>
    <td colspan="2">1</td><td rowspan="2">3</td><td>4</td><td rowspan="2">5</td>
</tr>

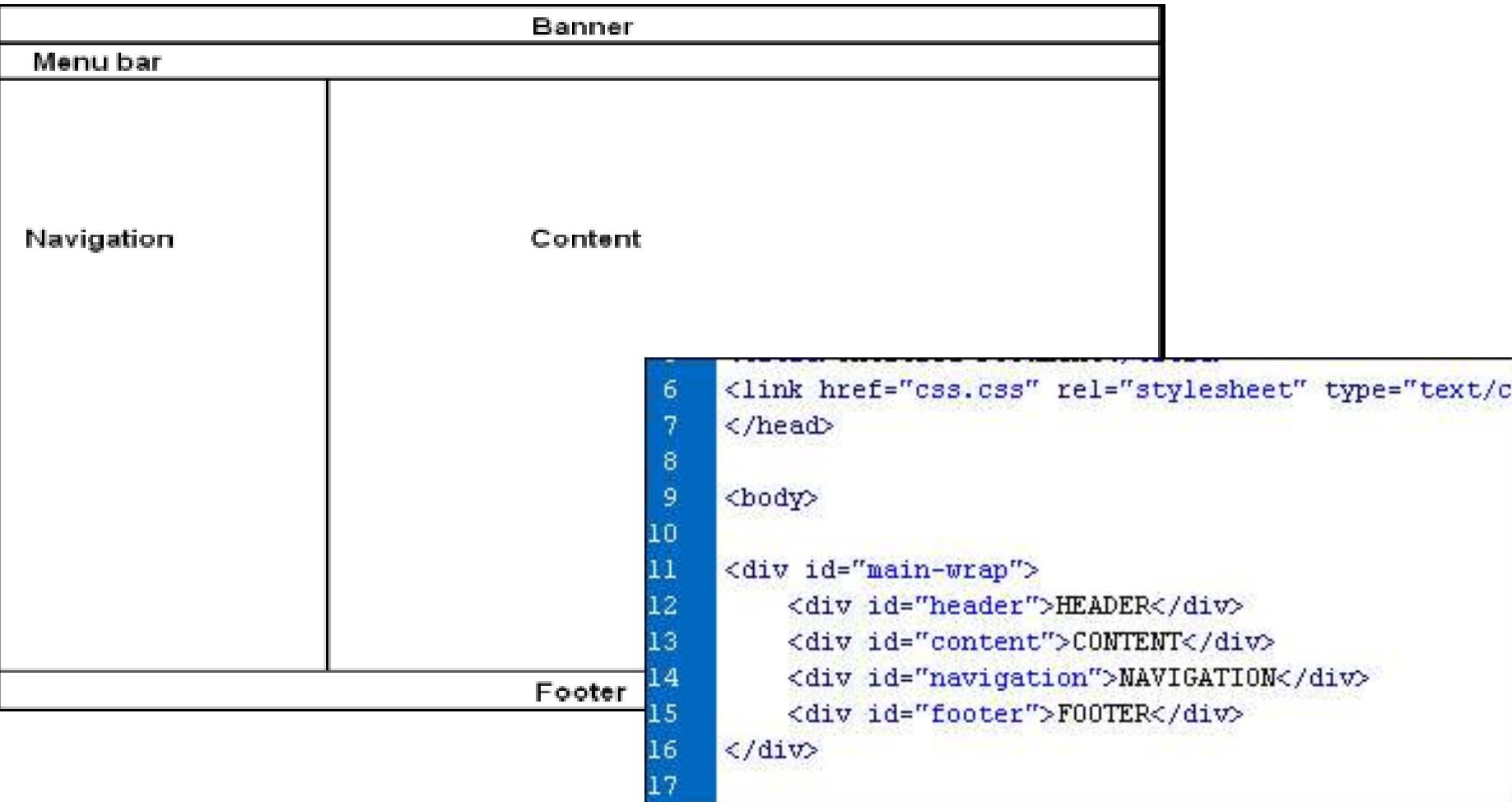
<tr>
    <td>1</td><td>2</td><td>4</td>
</tr>

</table>
</body>
```

Responsive Web Design Layout changes to fit the device

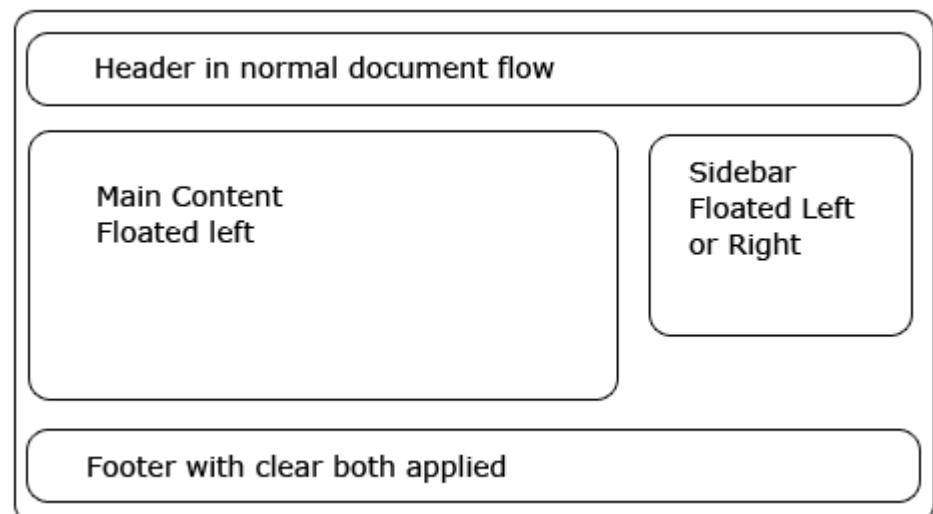


A Popular Page Layout using <div>

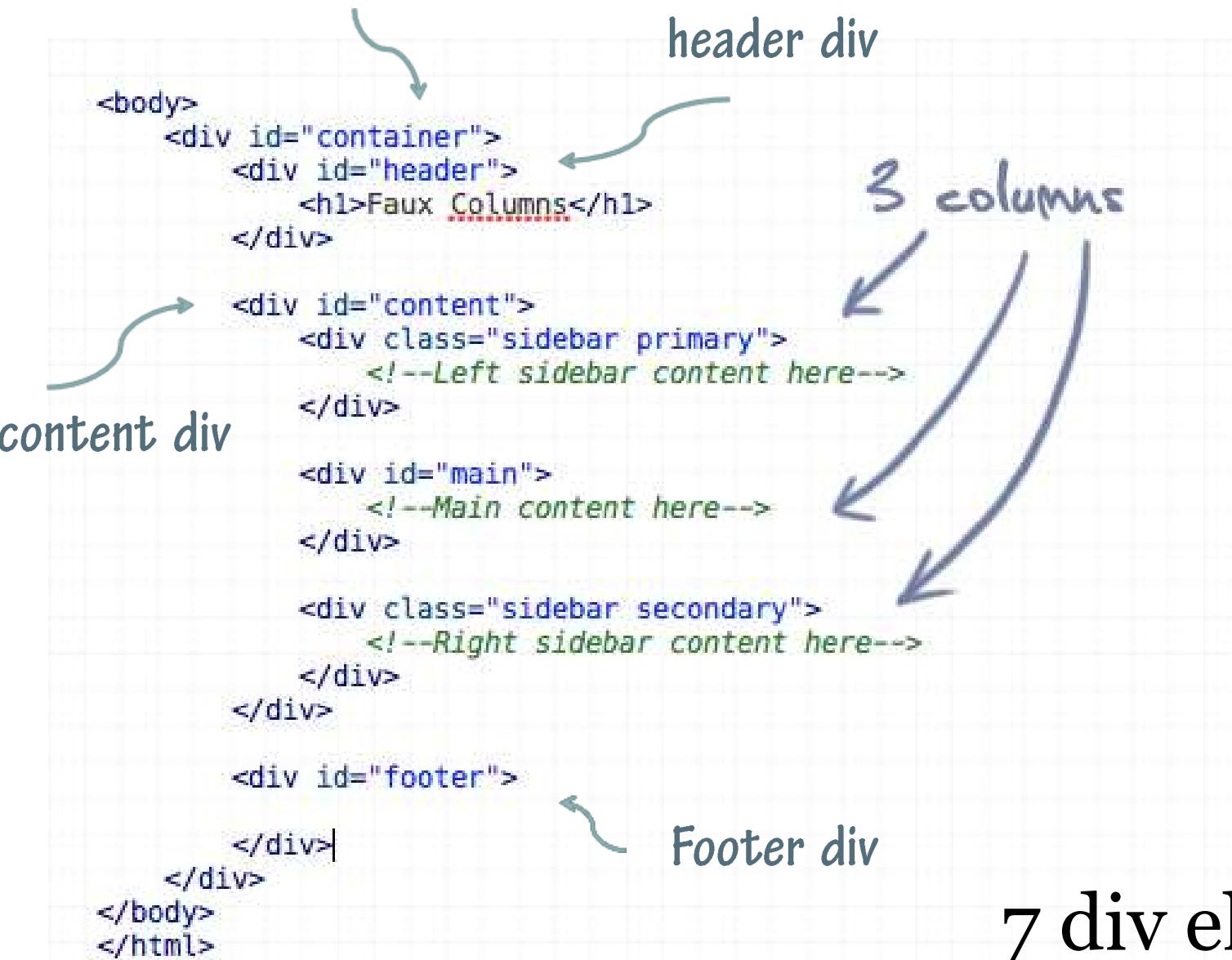


<div> defined

- The <div> tag defines a division or a section in an HTML document.
- The <div> tag is used to group block-elements to format them with CSS.
- The <div> element is very often used together with CSS, to layout a web page

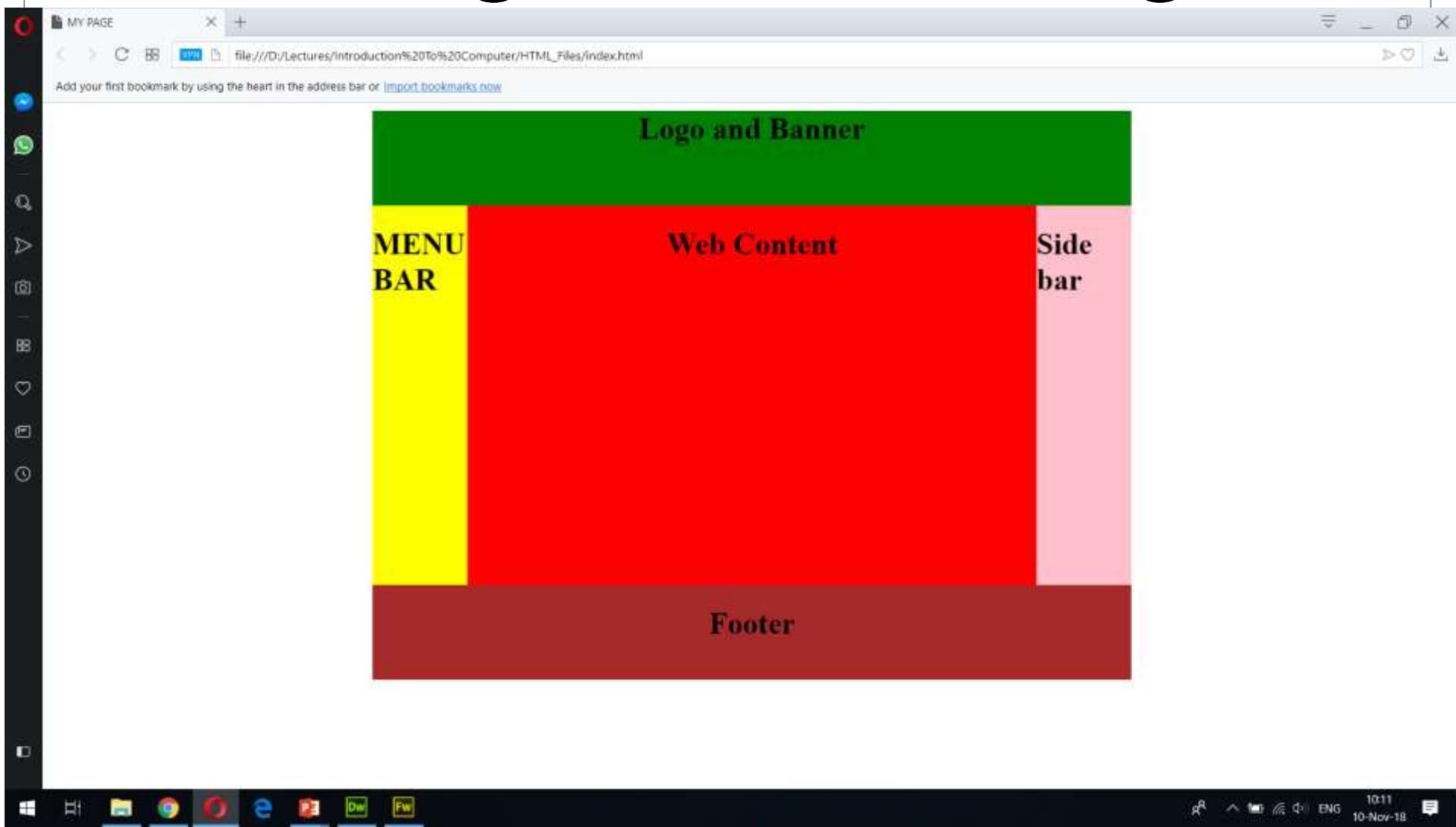


Container div



7 div elements

Design the web page using the <DIV> tags



```
<div id="container" style="background-color:grey; width:800px; height:600px; margin:auto;">
    <div id="header" style="background-color:green; width:100%; height:100px">
        <center><h1>Logo and Banner </h1></center>
    </div>

    <div id="content" style="background-color:blue; width:100%; height:400px;">
        <div id="sidebarleft" style="background-color:yellow; width:100px; height:100%; float:left;">
            <h1>MENU BAR</h1>
        </div>

        <div id="mean" style="background-color:red; width:600px; height:100%; float:left;">
            <center><h1>Web Content</h1></center>
        </div>

        <div id="sidebarright" style="background-color:pink; width:100px; height:100%; float:right;">
            <h1> Side bar</h1>
        </div>

    </div>

    <div id="footer" style="background-color:brown; width:100%; height:100px; float:left;">
        <center> <h1> Footer</h1></center>
    </div>
</div>
```

Questions



Algorithms and Programming Languages

A computer is a blank canvas
Waiting for you to instruct.
Plan out with pseudocode
Then program to construct.



How do I get Minion Stuart to move to D1?

	A	B	C	D
1				
2				
3				
4				

Move right 3 squares

How do I get Minion Stuart to move to D1 then to D4?

	A	B	C	D
1				
2				
3				
4				

Move right 3 squares
Move down 3 squares

How do I get Minion Stuart to move to D1 then to D4, then move to A4 and finally to A1?

	A	B	C	D
1				
2				
3				Move right 3 squares Move down 3 squares
4				Move left 3 squares Move up 3 squares

What have we just done

- You have created a series of instructions to solve a given problem
- This is called an **Algorithm**
- When we write it in a list of instructions it is called **Pseudocode**
- Computer Programmers use pseudocode to help plan out the code they will need.
 - For game making
 - Creating websites
 - Control software – robots / machinery
 - ANYTHING where planning is needed = pseudocode is used to layout the tasks/actions



Algorithm

- An algorithm is an ordered set of unambiguous, executable steps that defines a terminating process.
- Algorithms are part of many activities, even mundane ones.
- Note: Researchers believe that the human mind including imagination, creativity, and decision making, is actually the result of algorithm execution.
 - This is used in artificial intelligence

Example



- Obtain a basket of unshelled peas and an empty bowl.
- As long as there are unshelled peas in the basket continue to execute the following steps:
 - a. Take a pea from the basket
 - b. Break open the pea pod
 - c. Dump the peas from the pod into the bowl
 - d. Discard the pod

Defining the Algorithm

Non-terminating sequence

1 2 3 4 5 6 7 8 9 10 11 ... (*this could go on for ever!*)

Ambiguous

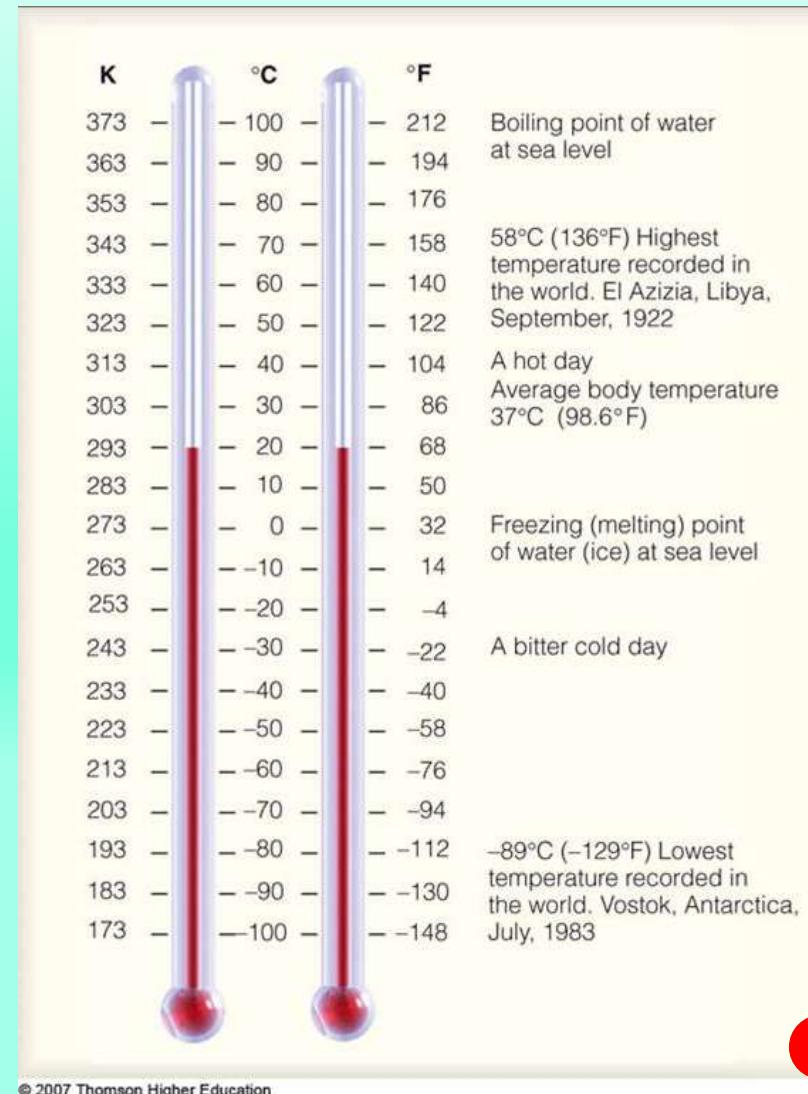
Organize the CDs (*By title? By artist? By genre?*)

- An **algorithm** is an ordered set of unambiguous, executable steps that defines a terminating process.
 - Steps do not have to be executed in sequence.
- **Non-Terminating Sequence:**
 - Make a list of positive integers.
 - The above requirement could not be performed in an algorithm, because it does not terminate (it is infinite).
- **Unambiguous**
 - The instructions must be clear, specific and direct
 - No room for creativity or interpretation



Abstract Nature of Algorithms

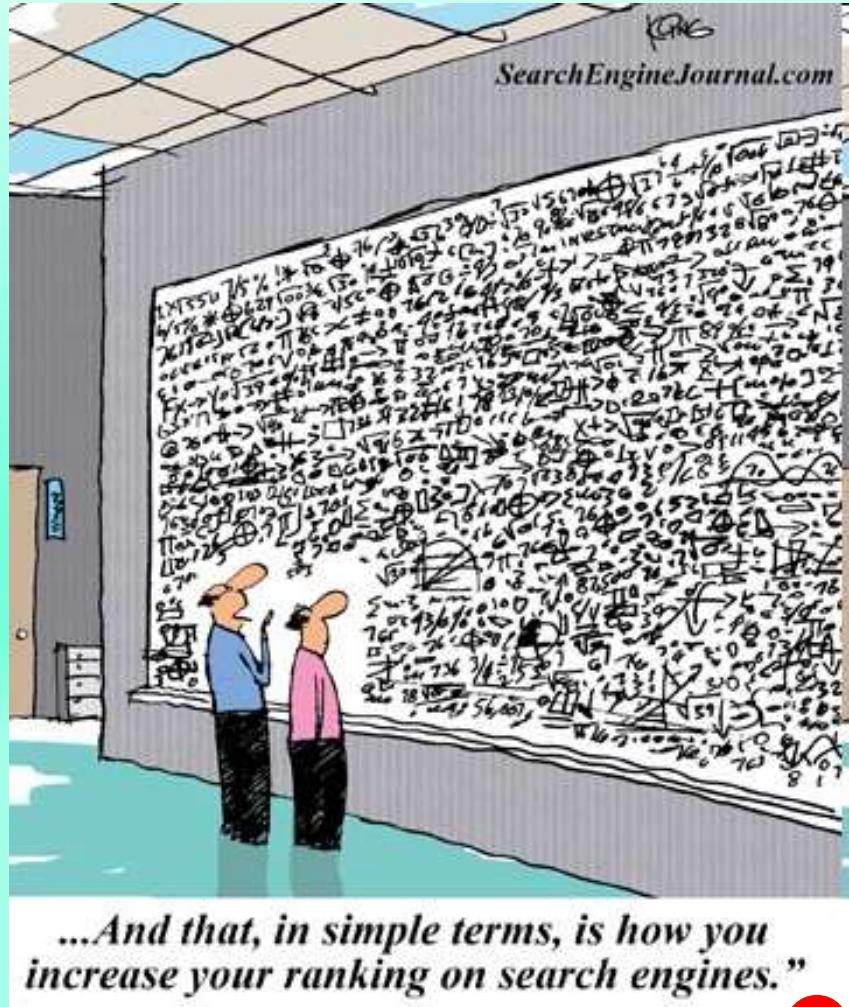
- An **algorithm** can represented in several ways.
- Example: Algorithm to convert temperatures from Celsius to Fahrenheit:
 - As an algebraic formula:
 - $F = (9/5)C + 32$
 - As a written instruction:
 - Multiply the temperature reading in Celsius by 9/5 and then add 32



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Algorithm Representation

- Algorithm requires some form of a language.
- **Algorithm is a form of communication**
 - Don't want misunderstandings
 - Proper level of detail
 - Proper level of difficulty
- Problems arise when:
 - Steps not precisely defined
 - Not enough detail

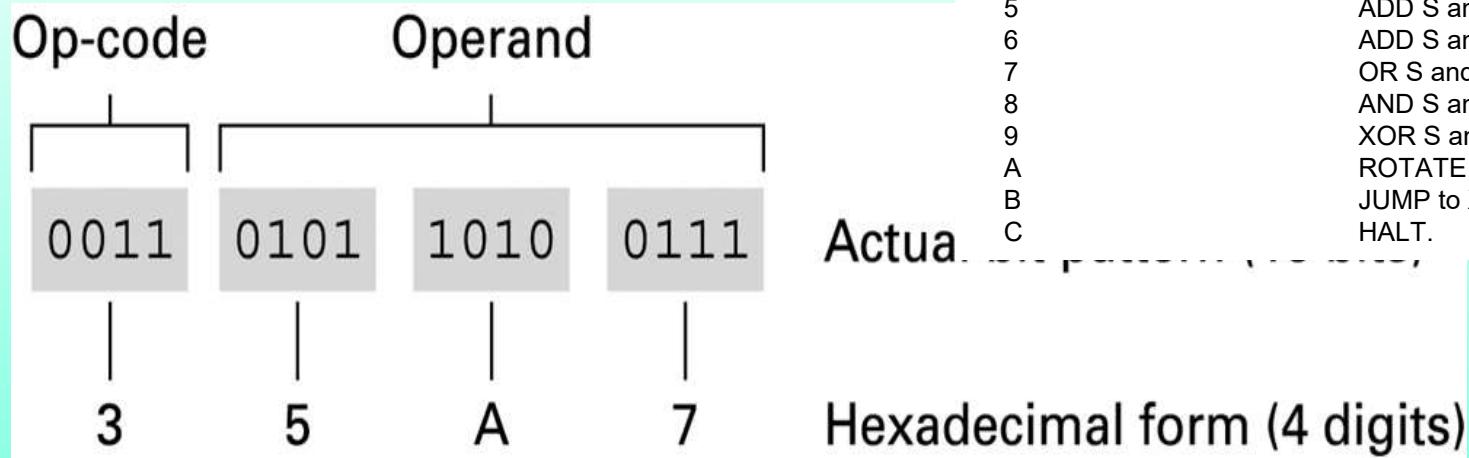


Algorithm Representation

Op-code	Description
1	LOAD reg. R from cell XY.
2	LOAD reg. R with XY.
3	STORE reg. R at XY.
4	MOVE R to S.
5	ADD S and T into R. (2's comp.)
6	ADD S and T into R. (floating pt.)
7	OR S and T into R.
8	AND S and T into R.
9	XOR S and T into R.
A	ROTATE reg. R X times.
B	JUMP to XY if R = reg. 0.
C	HALT.

- **Primitive** – A well defined set of building blocks (terms) used in computer science.
 - Arithmetic and logic operations built into the language
 - Removes any ambiguity
 - Includes its own syntax
- **Programming language** – A collection of primitives (terms) and the rules that state how the primitives can be combined to represent more complex ideas.

Op-code	Operand	Description
1		LOAD reg. R from cell XY.
2		LOAD reg. R with XY.
3		STORE reg. R at XY.
4		MOVE R to S.
5		ADD S and T into R. (2's comp.)
6		ADD S and T into R. (floating pt.)
7		OR S and T into R.
8		AND S and T into R.
9		XOR S and T into R.
A		ROTATE reg. R X times.
B		JUMP to XY if R = reg. 0.
C		HALT.



Store the bits found in register 5 in main memory cell A7

- Machine language uses primitives
- High-level programming languages (C++, Java) use higher-level primitives, constructed from the lower-level machine language primitives.
- This results in an easier set of instructions to write.
- More later.

Programming Tools

- Flowcharts
- Hierarchy Charts
- Pseudocode

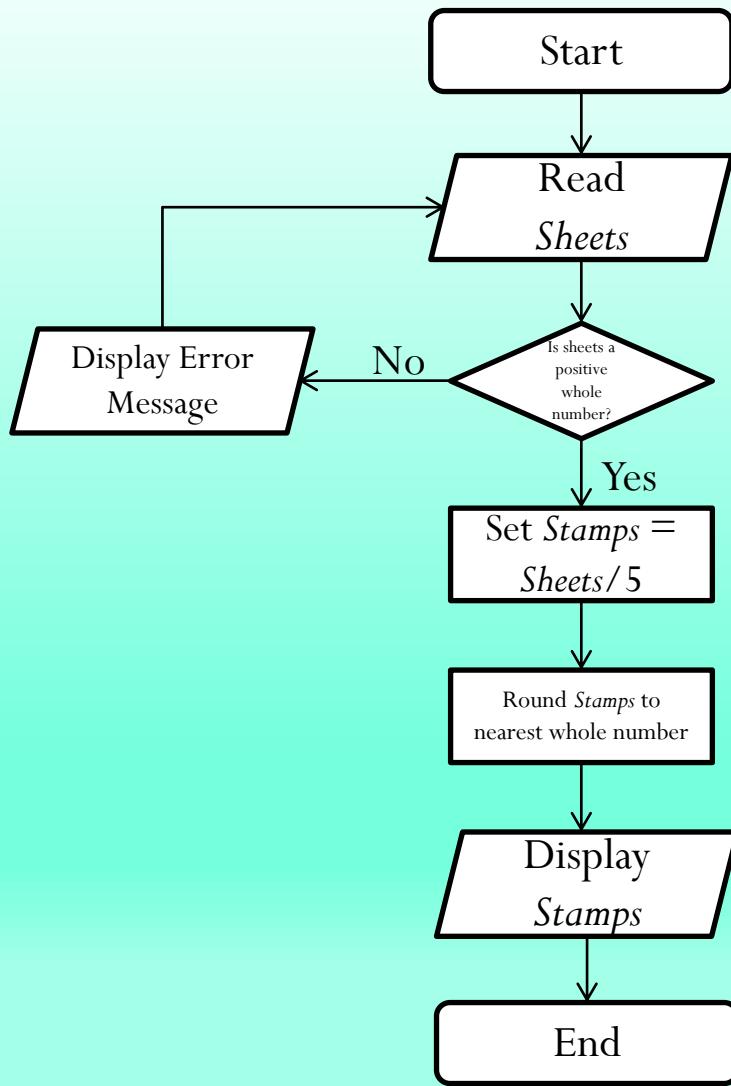
Programming Tools

Flowcharts

A chart that consists of symbols connected by arrows.

Within each symbol is a phrase presenting the activity at that step.

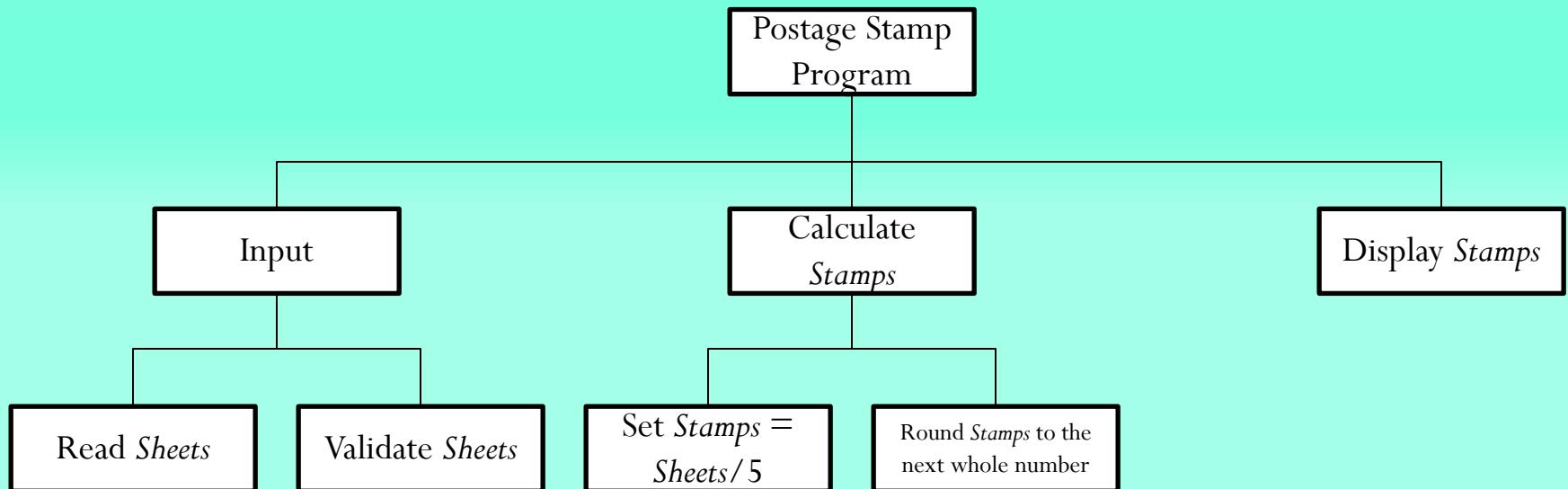
The shape of the symbol indicates the type of operation that is to occur.



Programming Tools

Hierarchy Charts

- A chart that shows the overall program structure.
- These charts describe what each part, or module, does and how they are related.
- These modules intentionally omit details of how they work.



Pseudocode

Pseudocode

1. Start
2. Enter two numbers.
3. Add the numbers together.
4. Display the result.
5. End

- **Pseudocode** – A notational system in which ideas can be expressed informally during the algorithm development process. (written sentence)
- Used independently of the programming language.
 - Each programming language has its own primitives and rules.

Algorithm Solution written in pseudocode

1. Move forward 100
2. Turn right 90 degrees
3. Move forward 100
4. Turn right 90 degrees
5. Move forward 100
6. Turn right 90 degrees
7. Move forward 100
8. Turn right 90 degrees



CHECKPOINT



What have we done so far?

- Created a series of actions to solve a given problem.
 - This is called an **Algorithm**
- Written the list of actions in a numbered sequence
 - This is called **Pseudocode**



In your workbooks I want you to think about how to get Minion Stuart to move around the squares and collect the bananas. You will need to move him and also add actions needed to pick up the items.

	A	B	C	D
1				
2				
3				
4				

Your Turn

Extension = Can you add a 'question to say if the minion reaches a banana?





Algorithm Solution written in pseudocode

	A	B	C	D
1	A small yellow Minion character is standing on the light gray square at position A1.		A single yellow banana is positioned on the light gray square at position C1.	
2		A single yellow banana is positioned on the light gray square at position B2.		A single yellow banana is positioned on the light gray square at position D2.
3			A single yellow banana is positioned on the light gray square at position C3.	
4	A single yellow banana is positioned on the light gray square at position A4.			

1. Move right 2 squares
2. Pick up banana
3. Move right 1 square
4. Move down 1 square
5. Pick up banana
6. Move left 2 squares
7. Pick up banana
8. Move down 1 square
9. Move right 1 square
10. Pick up banana
11. Move down 1 square
12. Move left 2 squares
13. Pick up banana

Can you ask a question?

- When we think about the way Minion Stuart moves across could we ask a question as he moves from one side to the other?

1. Move across 3 squares

2. If you reach a banana

a. Pick it up

Ask the question – try and start it with an 'IF'

Ask the question – try and start it with an 'IF'



Can we ask a question?

	A	B	C	D
1				
2				
3				
4				



Possible algorithm in pseudocode



	A	B	C	D
1				
2				
3				
4				

1. Move right 3 squares
2. IF Minion reaches a banana
 - a. THEN pick it up
3. IF Minion reaches an apple
 - a. THEN leave it

This form of pseudocode would help a game designer plan out the code they would need to write to create it.

This would continue to cover the whole board

Primitive Operations

- ❖ To describe an algorithm, we need some well-defined programming primitives
 - Assignment primitive:
 - *assignment statement, input/output statements*
 - Conditional primitive:
 - *if statement*
 - *case statement*
 - Looping (iterative) primitive:
 - *for loop,*
 - *while loop,*
- ❖ Statements are executed one-by-one

Pseudocode

Conditional selection

- The selection of one of two possible activities depending upon the truth or falseness of some condition

if condition then action

or

if condition then (activity)
else (activity)

- If this condition is true, perform this activity.

If (sunny)
then (put on sunscreen)

- If this condition is true, perform this activity.

If (sunny)
then (go swimming)
else (go bowling)



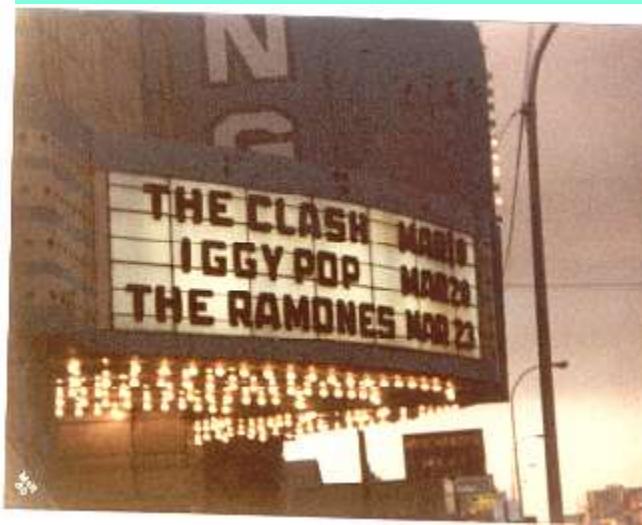
Repeating structure

- Another common semantic structure is the repeated execution of a statement or sequence of statements as long as some condition remains true.

while *condition* **do** *activity*

- Also known as a while loop
- Examples:

while (*tickets remain to be sold*)
do (*sell a ticket*)



Repeating structure

Counter

501

Hello
Hello
Hello
Hello

...

Hello

<End of loop>

Task: Write Hello 500 times.

Pseudocode

Counter = 1

While counter is less than or equal to 500, write the word “Hello” and add 1 to Counter.

Programming Code

Counter ← 1

While (counter <= 500)

do

 (

 print “Hello”;

 Counter ← Counter + 1

)

For loop

Counter

501

Hello
Hello
Hello
Hello

...

Hello

<End of loop>

- A for loop can be used to accomplish the same thing as a while loop.
- Note: There are some differences between while and for loops.

Counter \leftarrow 1

For (Counter \leq 500)

do

(

 print the message “Hello”;

 Counter \leftarrow Counter + 1

)



Flow Charts

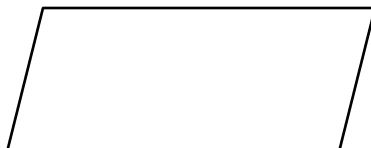
- Flow Line - indicates the flow of logic



- Terminal – indicates the start or end of a task



- Input/Output – used for input or output operations. What is to be input or output should be in the figure.

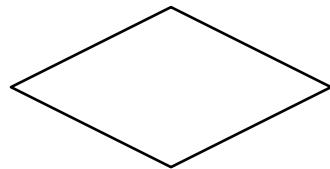


Flow Charts

- Processing - used to show a processing step. The instructions are displayed in the figure.



- Decision – used to show when a decision needs to be made. Lines for yes and no come out of it. The question is displayed in the figure.



- Connector – Used to join flow lines.



Conditional Primitives...

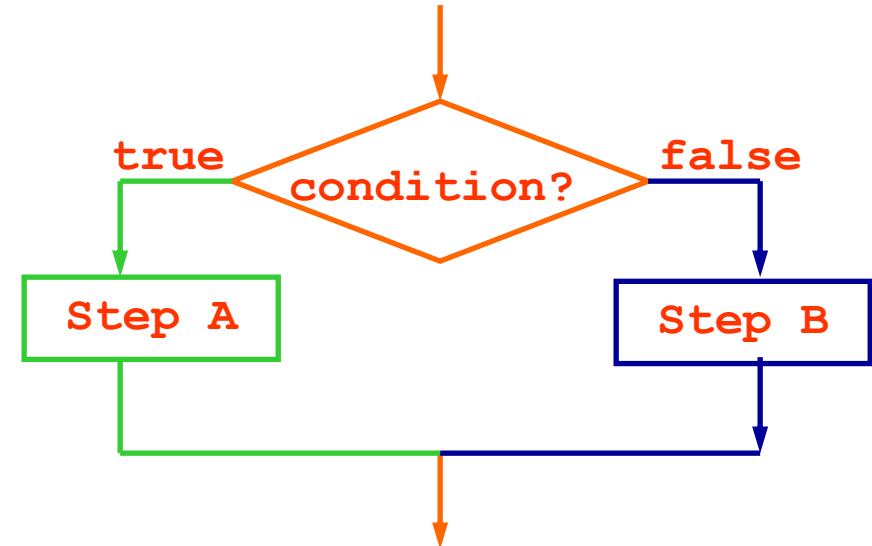
if statement

to take different actions based on condition

Syntax

```
if (condition)
    then (Step A)
    else (Step B)
endif
```

```
if (condition)
    then (Step A)
endif
```



Semantics

Examples -- (if statement)...

```
Let mark be the total-mark obtained  
if (mark < 40)  
    then (print "Student fail")  
    else (print "Student pass")  
endif  
  
...
```

If grade >= 90 Then result ← "A"	' display "A"
Elseif grade >= 80 Then result ← "B"	' display "B"
Elseif grade >= 70 Then result ← "C"	' display "C"
Elseif grade >= 60 Then result ← "D"	' display "D"
Else result ← "F"	' display "F"
End If	
Print "Student grade is", result	

Looping Primitive – while-loop

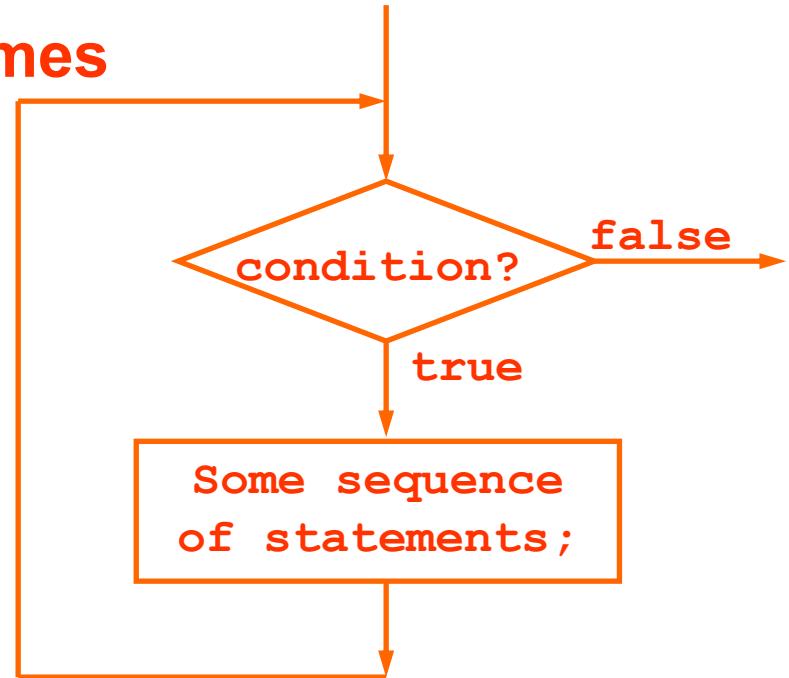
while-loop

loop a “variable” number of times

Syntax

```
while (condition) do  
    (some sequence  
     of statements)  
endwhile
```

Semantics...



Looping Primitive – for-loop

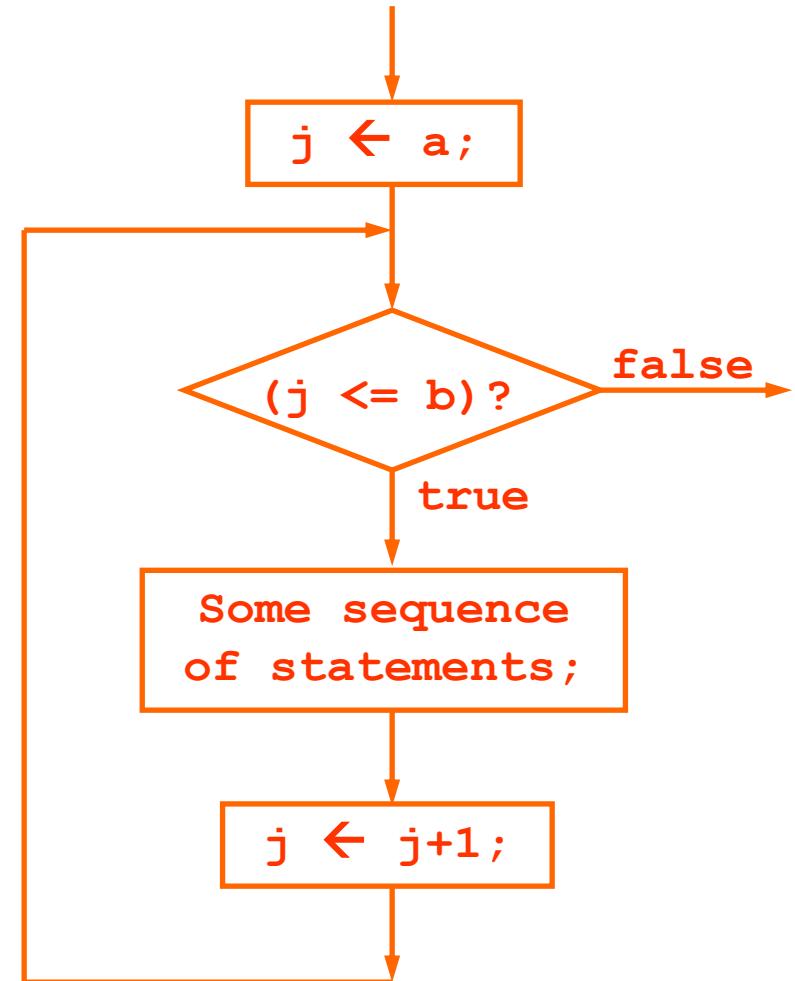
First, the for-loop

loop a “fixed” or
(pre-determined) number of
times

Syntax

```
for j ← a to b do
    (some sequence
        of statements)
endfor
```

Semantics...



“Exercising the alg”: for and while

```
for j <- 1 to 4 do
    print 2*j;
endfor
print "---- Done ----"
```

```
j <- 1;
while (j <= 4) do
    print 2*j;
    j <- j + 1;
endwhile
print "---- Done ----"
```

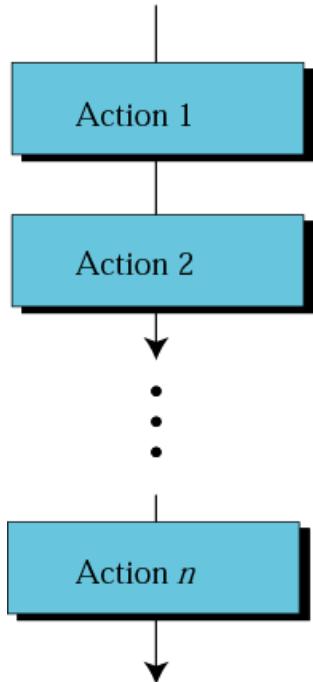
Output:

```
2
4
6
8
---- Done ----
```

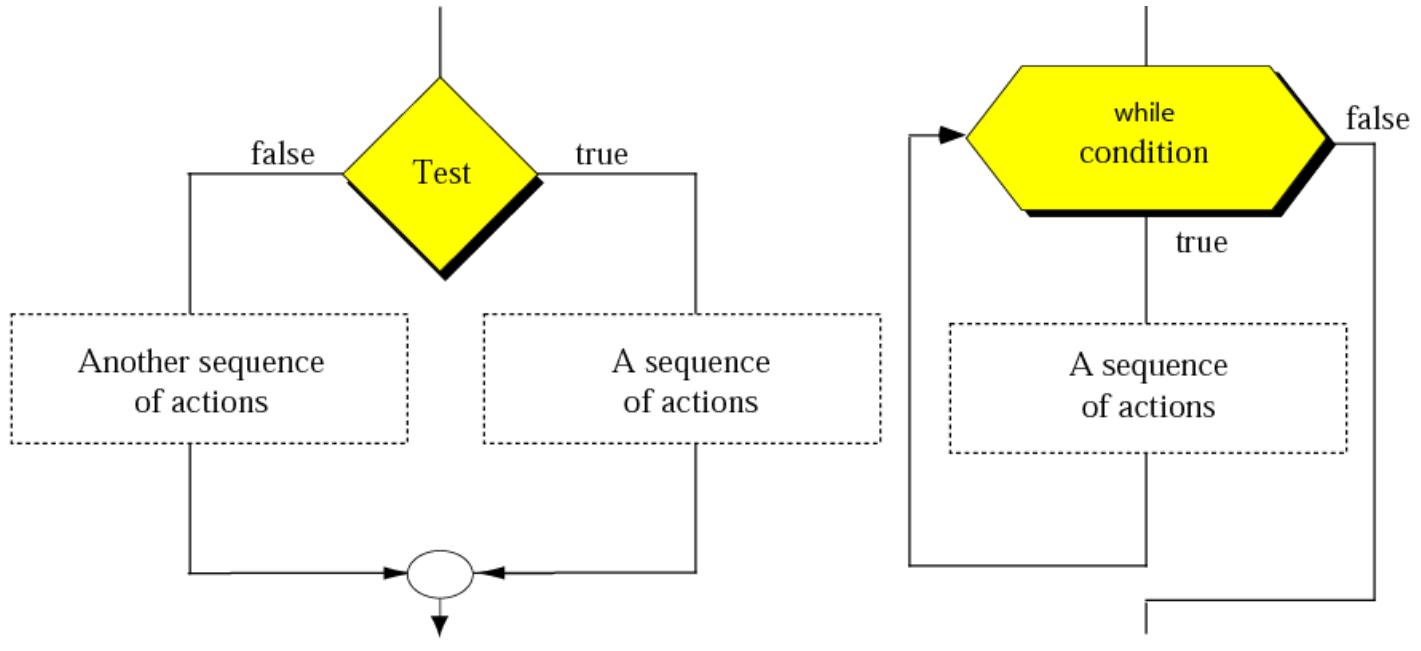
Output:

```
2
4
6
8
---- Done ----
```

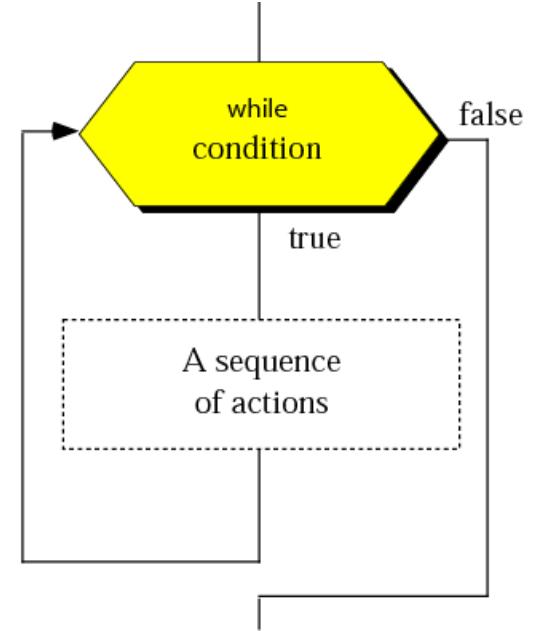
Flowcharts for three constructs



a. Sequence



b. Decision



c. Repetition

PSEUDO-CODE

EXERCISES

Draw the Flow Chart of The Given PSEUDO Code

count \leftarrow 0

WHILE count < 10

ADD 1 to count

OUTPUT count

ENDWHILE

OUTPUT "The End"

Sum of 2 Numbers

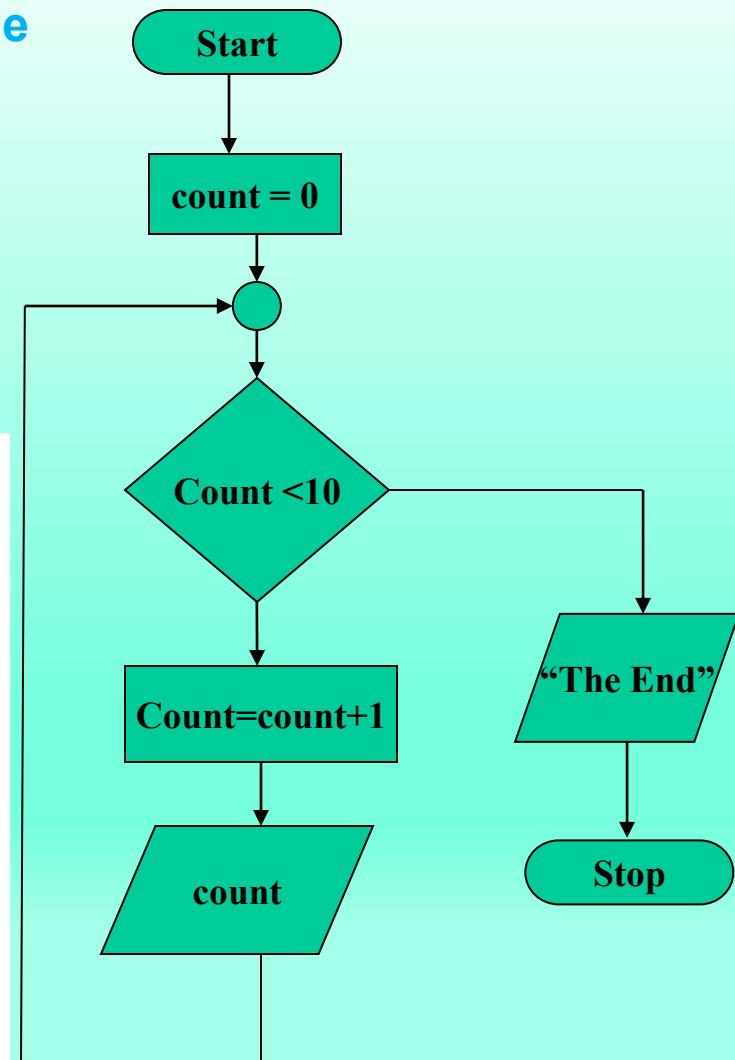
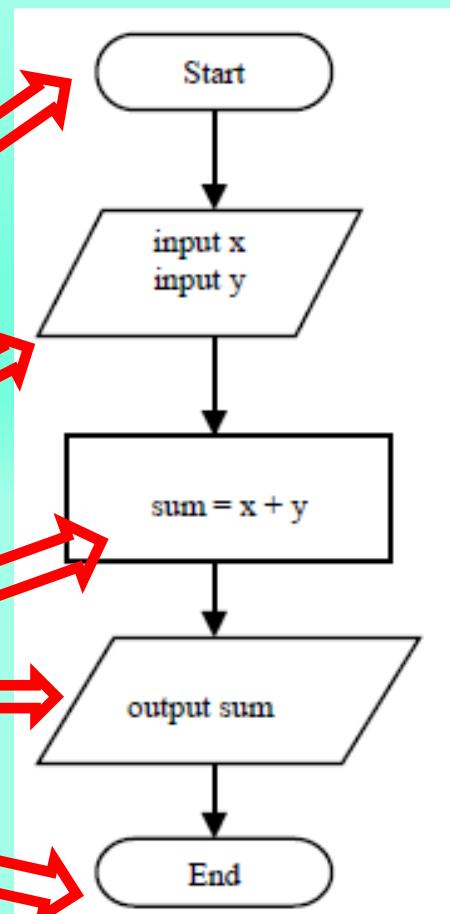
Start

input x, y

sum \leftarrow x + y

output sum

Stop



Solve Quadratic Equation

$$ax^2 + bx + c = 0$$

- Write the Pseudocode
- Draw the Flowchart

Pseudocode

START

INPUT a,b,c

$$d \leftarrow b^2 - 4ac$$

IF ($d > 0$) THEN

$$x_1 \leftarrow \frac{-b + \sqrt{d}}{2a}$$

$$x_2 \leftarrow \frac{-b - \sqrt{d}}{2a}$$

OUTPUT "ROOT 1:"+x1

OUTPUT "ROOT 2:"+x2

ELSE IF ($d == 0$) THEN

$$x_1 \leftarrow \frac{-b}{2a}, x_2 \leftarrow \frac{-b}{2a}$$

OUTPUT "ROOT 1:"+x1

OUTPUT "ROOT 2:"+x2

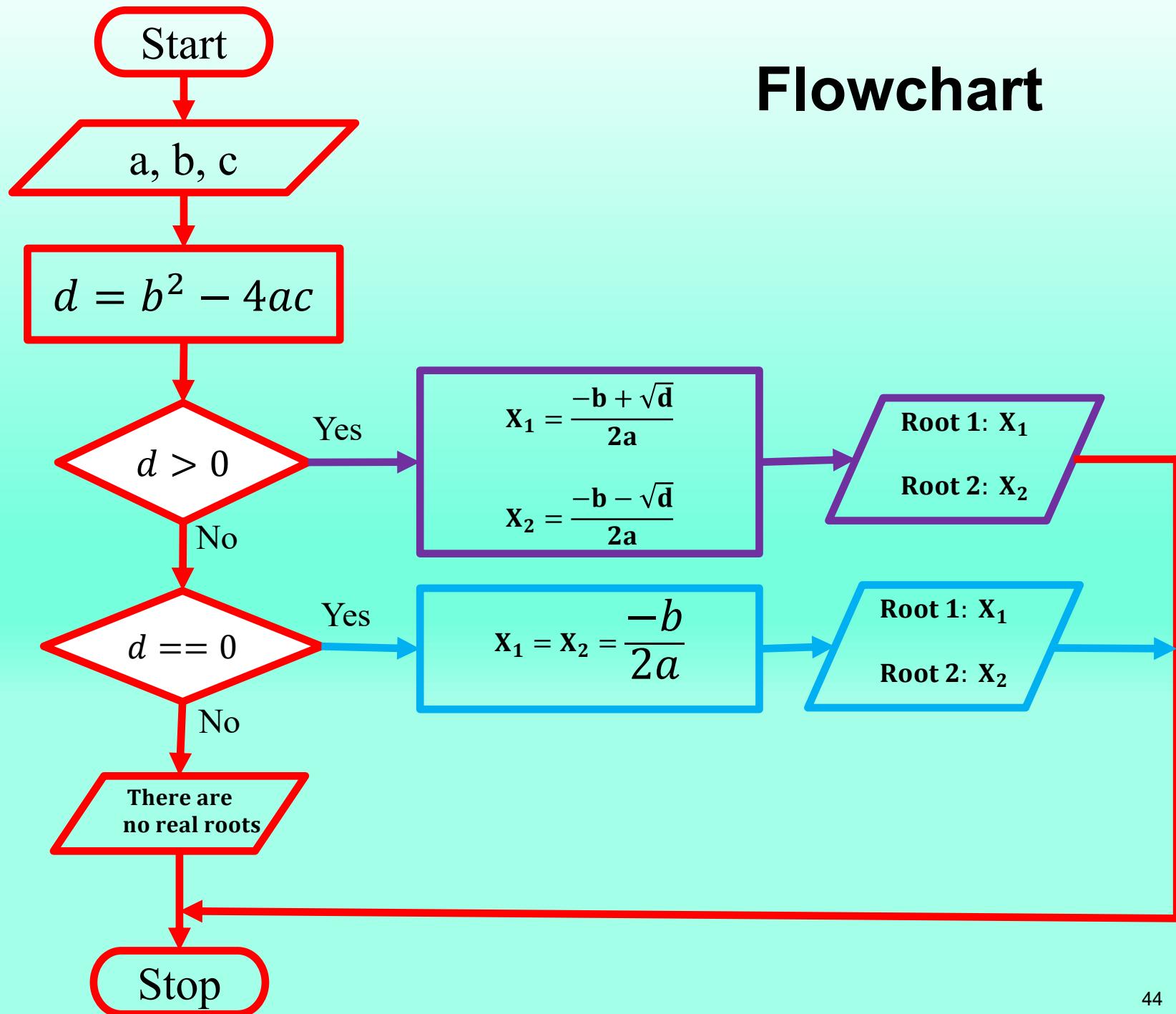
ELSE

OUTPUT "There is no real root"

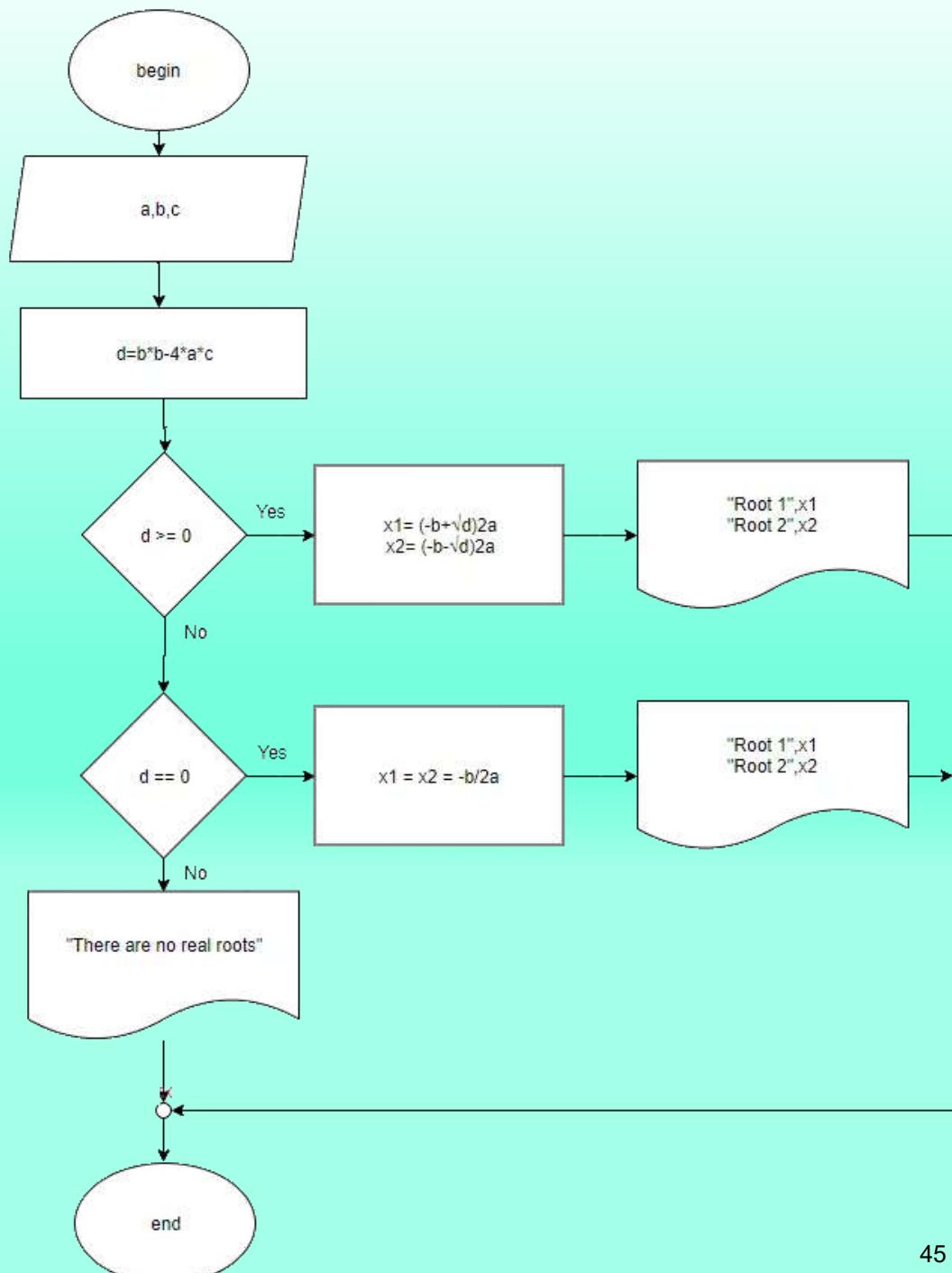
ENDIF

STOP

Flowchart



Different Representation

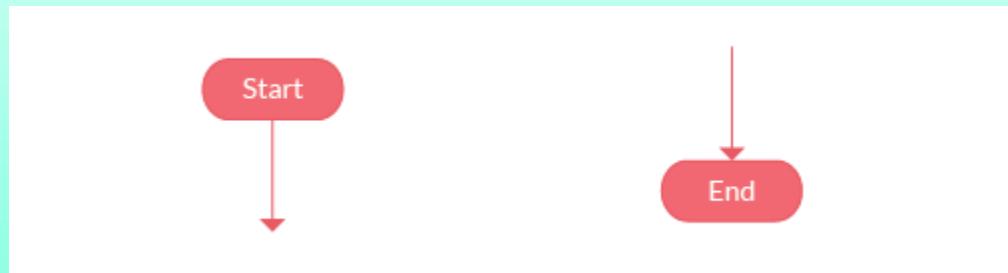


Take A Brief Look At Flowchart

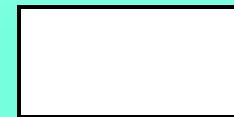
Terminal / Terminator



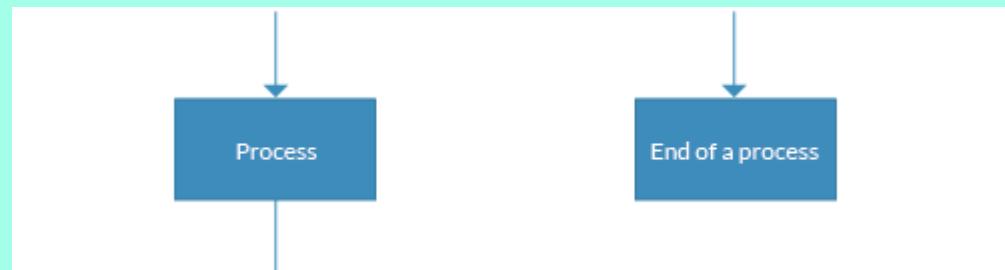
- The terminator shows where your process begins or ends.
- You can use words like 'Start', 'Begin', 'End' inside the terminator shape to make things more obvious.



Process / Rectangle



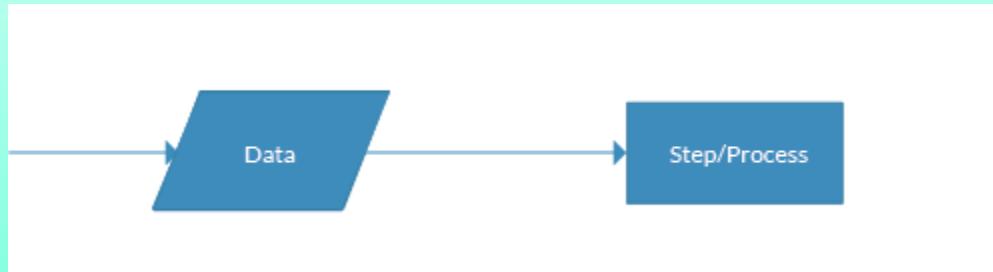
- Flowchart process shape is used to represent a process, action step or an operation.
- While these are pictured with rectangles, the text in the rectangle mostly includes a verb.



Data (I/O)

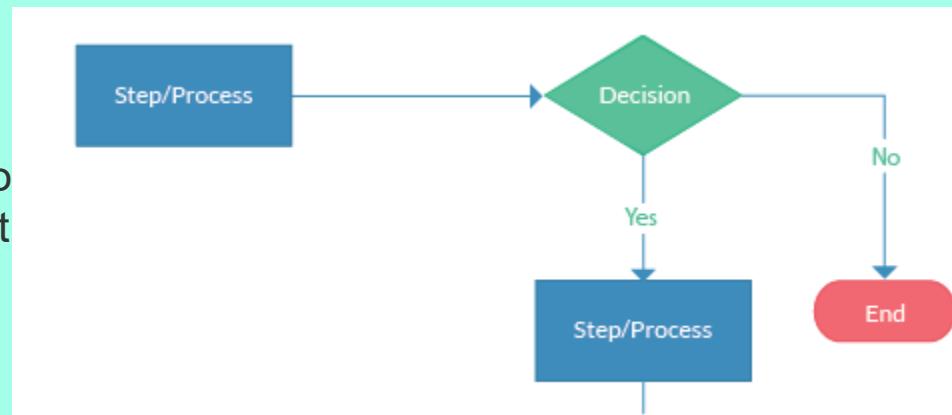
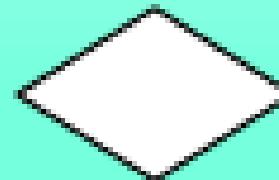


- The Data object, often referred to as the I/O Shape shows the Inputs to and Outputs from a process.
- This takes the shape of a parallelogram



Decision / Conditional

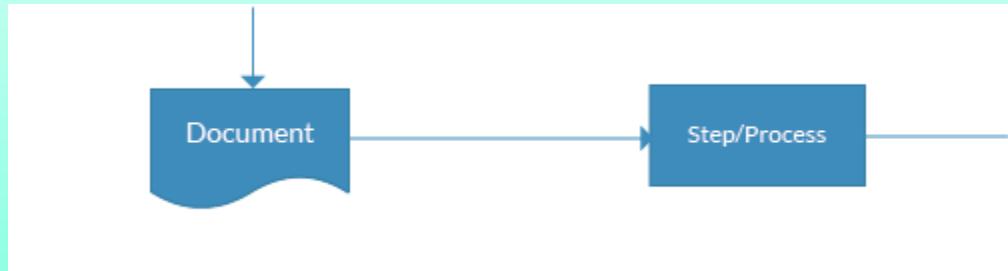
- Decision shape is represented as a Diamond. This object is always used in a process flow to ask a question.
- The answer to the question determines the arrows coming out of the Diamond.
- This shape is quite unique with two arrows coming out of it.
- One from the bottom point corresponding to Yes or True and one from either the right/left point corresponding to No or False.



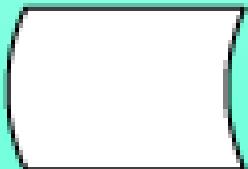
Document



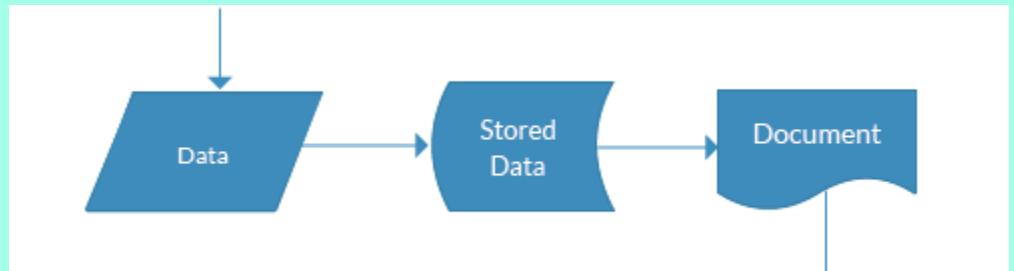
- Document object is a rectangle with a wave-like base.
- This shape is used to represent a Document or Report in a process flow.



Stored Data



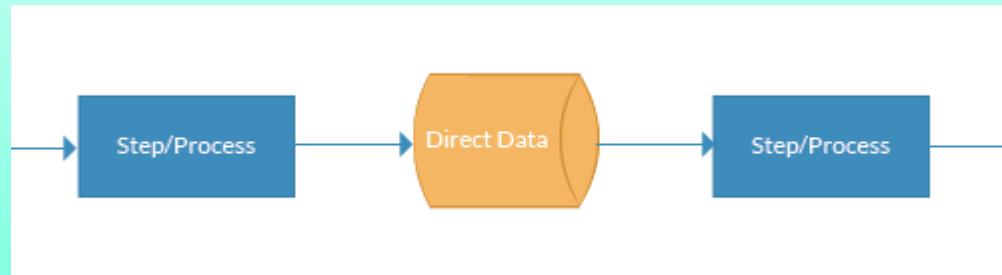
- This is a general data storage object used in the process flow as opposed to data which could be also stored on a hard drive, magnetic tape, memory card, or any other storage device



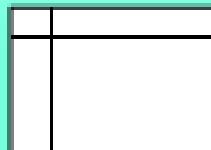
Direct Data



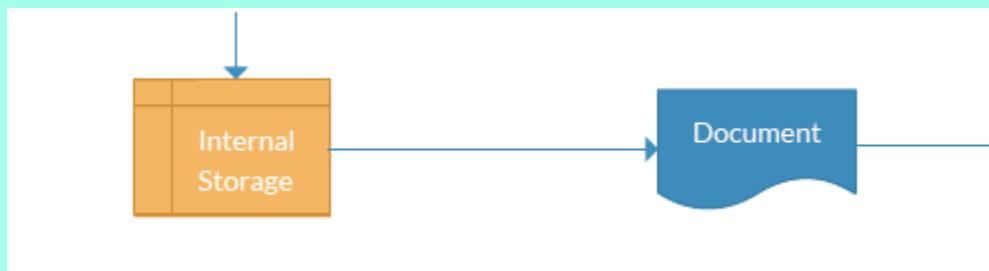
- Direct Data object in a process flow represents information stored which can be accessed directly.
- This object represents a computer's hard drive.



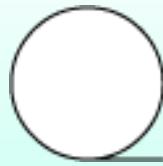
Internal Storage



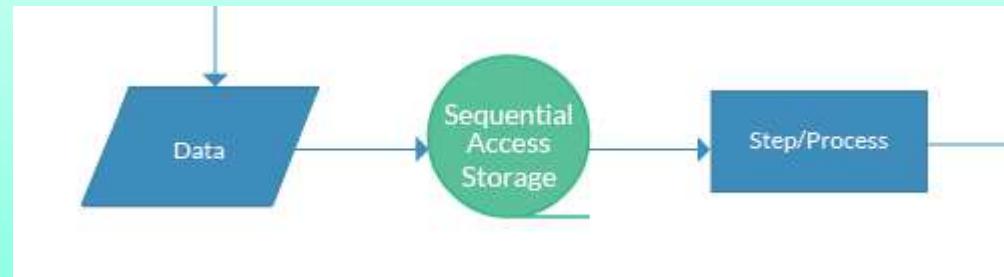
- This is a shape which is commonly found in programming flowcharts to illustrate the information stored in memory, as opposed to on a file.
- This shape is often referred to as the magnetic core memory of early computers; or the random access memory (RAM) as we call it today.



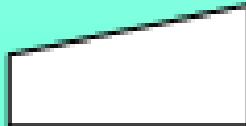
Sequential Access



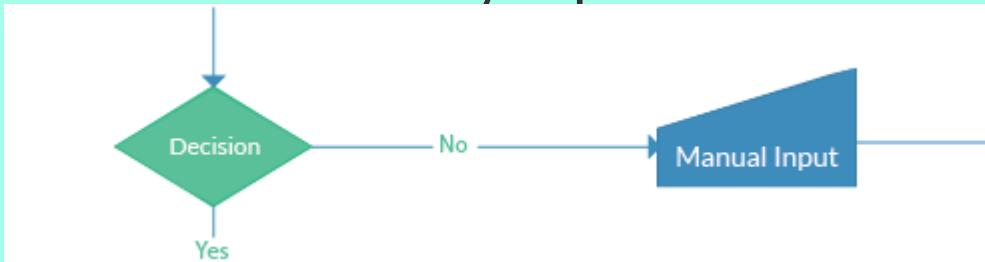
- This object takes the shape of a reel of tape.
- It represents information stored in a sequence, such as data on a magnetic tape.



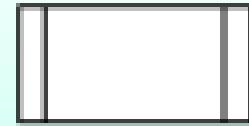
Manual Input



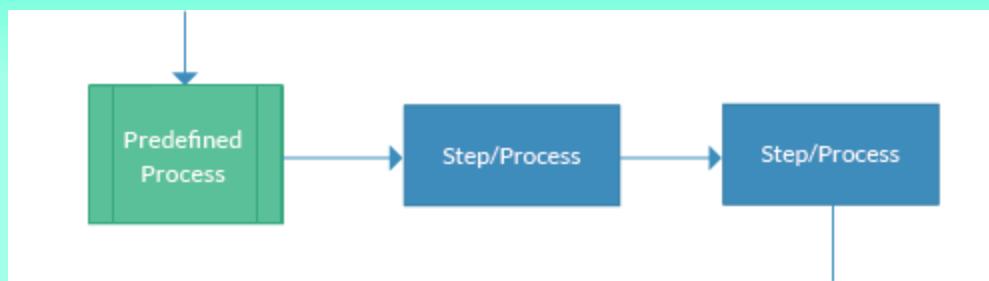
- This object is represented by rectangle with the top sloping up from left to right.
- The Manual Input object signifies an action where the user is prompted for information that must be manually input into a system



Subroutine / Predefined Process



- This shape takes two names - 'Subroutine' or 'Predefined Process'.
- It's called a subroutine if you use this object in flowcharting a software program.
- This allows you to write one subroutine and call it as often as you like from anywhere in the code.
- The same object is also called a Predefined Process.
- This means the flowchart for the predefined process has to be already drawn, and you should reference the flowchart for more information.



Summary Of Pseudo-Code Statements

Statement	Purpose
Output	Display information
Input	Get information
Process	Perform an atomic (non-divisible) activity
Decision	Choose between different alternatives
Repetition	Perform a step multiple times

QUESTION ?