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Table of Content

Chapter 1

Introduction to Computing and ICT

Information and Communication Technology (ICT)

Information and Communication Technology (ICT) is defined as a comprehensive set of computing tools that collectively allow people and organizations to interact in the digital world. It is an umbrella term encompassing communication devices (television, cell phones), computer and network hardware, satellite systems, and various associated services and applications such as video conferencing, distance learning, and e-commerce. ICT also represents the technological convergence of telephone networks with computer networks via a single link system, enabling integrated data, voice, and video communication.

What is a System?

A system is a collection of interconnected components working together cohesively to achieve specific goals or objectives by processing inputs to produce desired outputs. Systems exist in both natural and artificial domains. Understanding a system's structure allows for better design, management, and optimization across fields like engineering, biology, and computing.

A system is described by four fundamental concepts:

1. **Objective/Purpose:** The primary goal the system is designed to achieve.
2. **Components:** The essential building blocks or parts that constitute the system.
3. **Environment:** Everything external to the system that interacts with or influences it.
4. **Communication/Interaction:** The mechanisms through which components and the system itself exchange information and coordinate their functions.

Types of Systems

Systems are broadly categorized into two main types:

1.3.1 Natural Systems

These occur organically in nature without human intervention. They are characterized by self-regulation, adaptability, stability, and are governed by natural laws (physics, chemistry, biology). They are highly intricate and interdependent.

- **Examples:** Ecosystems (forests, oceans), weather patterns, the solar system, the human body (circulatory, nervous systems), DNA, psychological systems (thoughts, emotions).

1.3.2 Artificial Systems

These are intentionally designed and built by humans to fulfill specific needs or solve problems. They are structured, require maintenance, and operate under predefined human-set rules and protocols.

- **Examples:**
  - **Knowledge Systems:** Mathematics, logic, databases, information management systems.
  - **Engineering Systems:** Civil (bridges, roads), mechanical (robotic arms), chemical (water treatment plants), electrical (home automation), software (library management systems).
  - **Social Systems:** Academic institutions, governments, corporations.
  - **Computer Systems:** The primary focus of this chapter.

Key Differences:

Feature	Natural Systems	Artificial Systems
Origin	Occur naturally.	Designed and built by humans.
Complexity	Highly intricate and interdependent.	Structured and relatively simpler.
Energy Source	Natural (sunlight, water flow).	Artificial (electricity, fuel).
Adaptation	Evolve autonomously over time.	Require human updates/redesign.
Governance	Natural laws.	Human-defined rules and protocols.

Systems and Science

The study of systems aligns with different scientific approaches:

- **Natural Science:** Focuses on understanding and describing existing natural systems (e.g., studying a forest ecosystem).
- **Design Science:** Focuses on creating new artificial systems to solve problems (e.g., developing conservation software).

- **Computer Science:** Utilizes methods from both. It studies the natural laws of computation (e.g., algorithm efficiency) and engages in the design science of creating new software and hardware systems.

The Computer as a System

Definition of a Computer

A computer is a programmable electronic device that accepts raw data as **input**, processes it according to a set of stored instructions (a program), produces useful **output**, and stores (**storage**) the results for future use. It performs arithmetic and logical operations automatically and without human intervention during processing.

Objectives of a Computer System

The main objectives are to perform computations, process data, and execute tasks efficiently to provide useful information to the user. This includes running software applications, managing files, facilitating communication, and automating complex processes.

Core Components of a Computer System (Hardware)

Computer hardware consists of physical, tangible components.

Input Devices
Tools that allow users to enter data and instructions into the computer.

- **Keyboard:** For entering text, numbers, and commands. The standard layout is QWERTY.
- **Mouse/Pointing Device:** Controls the cursor on the screen for selection and navigation. Includes touchpads on laptops.
- **Scanner:** Converts physical documents and images into a digital format.
- **Microphone:** Inputs audio data.
- **Webcam:** Captures live video and images.
- **Barcode Reader:** Scans barcodes to input product information quickly.
- **Touch Screen:** Serves as both an input (touch) and output (display) device.
- **Joystick/Gamepad:** Used for gaming and simulations.
- **Light Pen:** A historical pointing device for drawing directly on CRT screens.

One Liners: Introduction to Computing and ICT

1. ICT is an umbrella term for computing tools enabling interaction in the digital world, representing the convergence of telephone and computer networks.
2. A system is a collection of interconnected components working cohesively to achieve a specific objective by processing inputs into outputs.
3. The four fundamental concepts describing any system are its Objective, Components, Environment, and Communication/Interaction.
4. Natural systems occur organically, are self-regulated, adaptable, and governed by natural laws, such as ecosystems and the human body.
5. Artificial systems are human-designed, structured, require maintenance, and operate under predefined rules, like engineering, social, and computer systems.
6. Natural systems are governed by natural laws, while artificial systems operate under human-defined rules and protocols.
7. Design Science focuses on creating new artificial systems, like conservation software, to solve problems.
8. A computer is a programmable electronic device that accepts input, processes it according to stored instructions, produces output, and stores results.
9. The primary objectives of a computer system are to perform computations, process data, and execute tasks efficiently to provide useful information.
10. An input device allows users to enter data and instructions into a computer, such as a keyboard, mouse, or scanner.
11. The standard keyboard layout is QWERTY.
12. A touch screen serves as both an input (touch) and output (display) device.
13. The system unit houses the primary electronic components of a computer, including the motherboard and CPU.
14. The motherboard is the main circuit board connecting all components like the CPU, RAM, storage, and ports.
15. The CPU, or microprocessor, is the computer's "brain," responsible for fetching, decoding, and executing instructions.
16. The Control Unit (CU) directs and coordinates operations within the processor and manages data flow.
17. The Arithmetic Logic Unit (ALU) performs all mathematical calculations and logical comparisons.
18. Registers are high-speed temporary storage locations within the CPU for data and addresses being processed.
19. The Memory Address Register (MAR) holds the memory location of data to be fetched or stored.
20. The Memory Data Register (MDR) holds the data fetched from or to be written to memory.
21. The Program Counter (PC) holds the address of the next instruction to be executed.
22. The Current Instruction Register (CIR) holds the instruction currently being decoded and executed.

Practice MCQs

1. In the context of systems, which of the following is NOT one of the four fundamental concepts that describe any system?
a) Objective/Purpose
b) Components
c) Efficiency
d) Environment
Answer: c) Efficiency

2. What is the key, revolutionary principle proposed by John von Neumann that underlies almost all modern computer architectures?
a) The use of vacuum tubes
b) The stored-program concept
c) The Harvard architecture separation
d) Binary arithmetic logic
Answer: b) The stored-program concept

3. During the Fetch stage of the instruction cycle, what happens to the Program Counter (PC) after an instruction is retrieved?
a) It is decremented
b) It is loaded with the address of the fetched instruction
c) It is incremented
d) It is compared with the CIR
Answer: c) It is incremented

4. Which component of the CPU is specifically responsible for performing all mathematical calculations and logical comparisons?
a) Control Unit (CU)
b) Memory Data Register (MDR)
c) Arithmetic Logic Unit (ALU)
d) Cache Memory
Answer: c) Arithmetic Logic Unit (ALU)

5. What is the primary vulnerability associated with the Von Neumann architecture that can be exploited in attacks like buffer overflows?
a) Slow processing speed due to the bottleneck
b) Instructions and data residing in separate memory units
c) Instructions and data residing in the same memory space
d) The use of a single system bus
Answer: c) Instructions and data residing in the same memory space

6. Which of the following best distinguishes a compiler from an interpreter?
a) A compiler is used for system software, an interpreter for application software.
b) A compiler translates code line-by-line, while an interpreter translates the entire program at once.
c) A compiler translates the entire source code into machine code at once, producing an executable.
d) An interpreter produces an object file, while a compiler does not.
Answer: c) A compiler translates the entire source code into machine code at once, producing an executable.

7. A software that is copyrighted and distributed free of charge, but whose source code is typically not modifiable by the user, is classified as:
a) Open Source Software
b) Shareware
c) Freeware
d) Firmware
Answer: c) Freeware

Chapter 2

History of Computers

Introduction to Computers:

The word 'computer' originally referred to people who performed mathematical calculations. Before modern computers existed, these human 'computers' were employed to carry out complex arithmetic operations, often used in fields like astronomy, engineering, and navigation. This practice dates back to at least the 17th century.

The first recorded use of the word 'computer' in English was in 1613, describing a person who computes. Over the centuries, as technology progressed, mechanical and electronic devices took over the computational role. This evolution marked the transition from manual computing to the automated systems we rely on today.

Understanding the history of computing helps us appreciate the innovations and challenges faced by early scientists and inventors who laid the foundation for today's digital age.

The Mechanical Era (1600–1900)

During the Mechanical Era, inventors developed physical devices to assist in computation. These devices worked without electricity and were typically operated by hand.

Tally Sticks

Tally sticks were simple tools used since ancient times to record numbers, debts, or messages. They were not calculators but rather record-keeping aids. A notch on a stick represented a unit of value or count. These were used extensively in medieval Europe, especially for tax collection.

Abacus (c. 2400 BC)

The abacus is one of the oldest calculating tools known to humanity. First used in Babylon around 2400 BC and later perfected in China around 500 BC, the abacus consists of beads that can be moved along rods to perform arithmetic operations. It was especially useful in trading and finance and is still used today in parts of Asia.

One Liners: History of Computer

1. The word 'computer' originally referred to a person who performed mathematical calculations.
2. The first recorded use of the word 'computer' in English was in 1613.
3. The Mechanical Era of computing (1600-1900) involved physical devices operated without electricity.
4. Tally sticks were ancient record-keeping aids, not calculators, often used in medieval Europe for tax collection.
5. The abacus, dating to 2400 BC in Babylon, is one of the oldest calculating tools, using beads on rods.
6. Napier's Bones (1614), invented by John Napier, used inscribed rods to simplify multiplication and division.
7. The slide rule (1622), developed by William Oughtred, used logarithmic scales for complex calculations.
8. The Pascaline (1642) was a mechanical calculator created by Blaise Pascal to perform addition and subtraction.
9. Gottfried Wilhelm Leibniz designed the Stepped Reckoner (1672), capable of all four basic arithmetic operations.
10. The Arithmometer (1820) by Charles Xavier Thomas de Colmar was the first commercially successful mechanical calculator.
11. Charles Babbage, the Father of the Computer, proposed the Difference Engine and Analytical Engine.
12. The Difference Engine was designed to compute polynomial functions and print results automatically.
13. The Analytical Engine is considered the first design for a general-purpose mechanical computer.
14. Ada Lovelace wrote the first algorithm intended for the Analytical Engine, making her the first programmer.
15. Ada Lovelace suggested using binary and conceptualized machine-generated music.
16. The Scheutzian Engine (1843) was the first mechanical calculator to automatically print its results.
17. The Jacquard Loom (1881) used punch cards to control weaving patterns, inspiring future computer data input.
18. Herman Hollerith's Tabulating Machine (1890) used punched cards for data processing, starting with the U.S. Census.
19. The Tabulating Machine's innovation led to the founding of IBM.
20. The Electronic Era brought faster, smaller, more reliable machines using electricity and introduced programmability.
21. Konrad Zuse's Z1 (1936-1938) is considered the first freely programmable mechanical computer.
22. The Z1 used binary floating-point arithmetic and input via punched tape.

Practice MCQs

1. What was the original meaning of the word "computer"?
a) An electronic calculating device
b) A person who performs mathematical calculations
c) A mechanical automation tool
d) A data storage unit
Answer: b) A person who performs mathematical calculations

2. The Pascaline, invented by Blaise Pascal, was primarily designed to:
a) Perform multiplication and division
b) Weave complex fabric patterns
c) Assist with tax collection through addition and subtraction
d) Solve polynomial equations
Answer: c) Assist with tax collection through addition and subtraction

3. Which device is considered the first design for a general-purpose mechanical computer?
a) Difference Engine
b) Analytical Engine
c) Stepped Reckoner
d) Arithmometer
Answer: b) Analytical Engine

4. Ada Lovelace is historically significant for:
a) Inventing the first mechanical calculator
b) Writing the first algorithm intended for machine processing
c) Developing the stored-program concept
d) Building the first electronic computer
Answer: b) Writing the first algorithm intended for machine processing

5. The Tabulating Machine, which used punched cards for data processing, directly led to the founding of which company?
a) Microsoft
b) IBM
c) Intel
d) Apple
Answer: b) IBM

6. Konrad Zuse's Z1 is notable for being the:
a) First electronic digital computer
b) First computer to use vacuum tubes
c) First freely programmable mechanical computer
d) First commercial computer
Answer: c) First freely programmable mechanical computer

7. The Atanasoff-Berry Computer (ABC) introduced which of the following concepts?
a) Stored-program architecture
b) Use of transistors
c) Binary representation and electronic calculation using vacuum tubes
d) Integrated circuits
Answer: c) Binary representation and electronic calculation using vacuum tubes

8. What was the primary use of the Harvard Mark I during World War II?
a) Code-breaking
b) Ballistics calculations for the U.S. Navy
c) Predicting election results
d) Running business payroll
Answer: b) Ballistics calculations for the U.S. Navy

Chapter 3

Computer System: Architecture and Components

Introduction To Computer And Its Basic Operations

In today's information age, computers are used in every walk of life. They are found in devices ranging from MP3 players and toys to industrial robots, fighter aircraft, and beyond, making life easier and more comfortable.

Definition of a Computer

A computer is an electronic device that accepts input data and instructions via input devices, stores them until needed, processes the data, and produces output through output devices.

Basic Operations of a Computer

All computers perform four fundamental operations to carry out any task: **Input, Processing, Output, and Storage**.

- **Input Operation:** The process of capturing or accepting data or information using input devices (e.g., keyboard, mouse).
- **Processing Operation:** The transformation of input into output. The **Central Processing Unit (CPU)** performs this task under the direction of a program.
- **Output Operation:** The result or outcome of the processing, delivered via output devices (e.g., monitor, printer, speakers).
- **Storage Operation:** The process of retaining data, information, or instructions so the user can retrieve them when required. Storage can be temporary (e.g., RAM) or permanent (e.g., Hard Disk).

Evolution of Computing Devices

The term "computing device" refers to any machine that can perform calculations, from simple addition to managing complex systems.

- **Early Computing Devices:**
  - **Abacus (c. 3000 BC):** Considered the first computer, using a system of sliding beads for calculations.

One Liners: Computer Systems, Architecture and components

1. A computer is an electronic device that accepts input data and instructions, stores them, processes the data, and produces output.
2. The four fundamental operations of a computer are Input, Processing, Output, and Storage.
3. Input operation involves capturing or accepting data using input devices like a keyboard or mouse.
4. The Central Processing Unit (CPU) performs the transformation of input into output, which is the processing operation.
5. Output operation delivers the result or outcome of processing via devices like a monitor, printer, or speakers.
6. Storage operation retains data, instructions, or information for future retrieval, and can be temporary (RAM) or permanent (Hard Disk).
7. The Abacus (c. 3000 BC) is considered the first computing device, using sliding beads for calculations.
8. Charles Babbage proposed the Difference Engine (1822) to solve differential equations.
9. The Analytical Engine was Charles Babbage's later concept for a general-purpose computer.
10. Herman Hollerith's Tabulating Machine (1889) used punched cards and was developed for the U.S. census.
11. The Z3 (1941), developed by Konrad Zuse, was used for designing airplanes and missiles.
12. The Harvard Mark I (1944) was an electromechanical relay computer.
13. ENIAC (1946) was the first general-purpose electronic computer.
14. EDVAC (1945), designed by John von Neumann, introduced the stored-program concept.
15. UNIVAC-I (1951) was one of the first commercially available computers.
16. Microcomputers (Personal Computers) are the smallest and least expensive class, originally for individual users.
17. Types of microcomputers include Desktop, Notebook, Laptop, and Handheld devices (Palmtop, PDA, Smartphone).
18. Mainframe computers are the second most powerful and expensive, used by large organizations for critical, bulk-data processing.
19. Mainframes support many terminals simultaneously and are used for census, ERP, financial transactions, and airline reservations.
20. Supercomputers are the most powerful and expensive, designed for intense scientific, engineering, and business applications.
21. Supercomputers are used for weather forecasting, weapon research, space exploration, and complex simulations.
22. Mobile Computers are devices enabling mobile computing—processing and transmitting data wirelessly.
23. Mobile computers include laptops, smartphones, tablets, and PDAs, featuring wireless connectivity and portability.
24. Computer hardware refers to the physical, tangible components of a computer system (e.g., monitor, keyboard, mouse, CPU).
25. The primary function of hardware is to store and execute software.

Practice MCQs

1. Which of the following is NOT one of the four fundamental operations performed by all computers?
a) Input
b) Processing
c) Communication
d) Storage
Answer: c) Communication

2. Which early computing device, considered the first computer, used a system of sliding beads for calculations?
a) Analytical Engine
b) Difference Engine
c) Abacus
d) Pascaline
Answer: c) Abacus

3. The concept where both program instructions and data are stored in the same memory was introduced by which computer?
a) ENIAC
b) Harvard Mark I
c) EDVAC
d) UNIVAC-I
Answer: c) EDVAC

4. Which type of computer is specifically designed for intense scientific applications and is the most powerful and expensive?
a) Mainframe Computer
b) Microcomputer
c) Minicomputer
d) Supercomputer
Answer: d) Supercomputer

5. What is the primary functional distinction between computer hardware and software?
a) Hardware is logical, software is physical.
b) Hardware provides instructions, software executes them.
c) Hardware is tangible and performs physical work, software is intangible and provides instructions.
d) Hardware is stored permanently, software is temporary.
Answer: c) Hardware is tangible and performs physical work, software is intangible and provides instructions.

6. Which type of software acts as an interface between the computer hardware and the application software?
a) Utility Software
b) System Software
c) Firmware
d) Customized Software
Answer: b) System Software

7. A software translator that converts the entire source code into machine code at once, producing an object file, is called a(n):
a) Interpreter
b) Assembler
c) Compiler
d) Linker
Answer: c) Compiler

8. Customized banking software developed for a specific bank is an example of which category of application software?
a) General-Purpose Software
b) Productivity Software
c) Special-Purpose Software
d) System Software
Answer: c) Special-Purpose Software

Chapter 4

Number Systems, Digital Logics and Data Basics

Introduction to Digital Systems and Data

Modern technology is built upon the principles of digital systems. These systems process information using discrete values—primarily the binary digits 0 and 1—as opposed to the continuous signals found in the natural world. This chapter provides a comprehensive foundation in the core concepts that bridge data representation, logical processing, and structured data management. We will explore how computers represent numbers, text, and multimedia, how they perform logical and arithmetic operations using Boolean algebra and logic gates, and how complex data is organized and managed in database systems. Mastery of these topics is essential for understanding the inner workings of all computational devices.

Data and Number Systems

Data, Information, and Operations

- **Data** is a raw collection of facts, figures, and statistics related to an object. It is an organizational asset used to view past activities and make future decisions.
- **Information** is data that has been processed, manipulated, and organized into a meaningful and useful context (e.g., a student's percentage result).
- **Data Processing Operations** involve a series of actions to convert data into information:

1. **Data Capturing:** Recording data via source documents or input devices.
2. **Data Manipulation:** This includes:
   - **Classifying:** Organizing data into groups using codes.
   - **Calculating:** Performing arithmetic operations.
   - **Sorting:** Arranging data in a logical sequence.
   - **Summarizing:** Condensing data into a concise form.
3. **Managing Output Results:** This involves storing, retrieving, communicating, and reproducing the processed information.

One Liners: Number Systems, Digital Logics and Data Basics

1. Data is a raw collection of facts, figures, and statistics related to an object, used for viewing past activities and making future decisions.
2. Information is data that has been processed, manipulated, and organized into a meaningful and useful context.
3. The first data processing operation is Data Capturing, which involves recording data via source documents or input devices.
4. Data Manipulation includes the actions of Classifying, Calculating, Sorting, and Summarizing data.
5. The decimal number system uses a base of 10 and the digits 0-9, and is primarily for human everyday use.
6. The binary number system uses a base of 2 and the digits 0 and 1, and is used for internal computer processing.
7. The octal number system uses a base of 8 and digits 0-7, historically used for compact binary representation (3 bits/digit).
8. The hexadecimal number system uses a base of 16 and digits 0-9 and A-F, used for modern compact binary representation (4 bits/digit) and memory addressing.
9. Binary representation is used because digital circuits are built from transistors with two stable states: ON (1) and OFF (0).
10. To convert a decimal number to another base, repeatedly divide the decimal number by the target base and record remainders from bottom to top.
11. To convert binary to octal, group bits into sets of three from the right, pad with leading zeros if needed, and convert each group to its octal digit.
12. To convert binary to hexadecimal, group bits into sets of four from the right, pad with leading zeros if needed, and convert each group to its hex digit.
13. To convert octal to binary, convert each octal digit to its 3-bit binary equivalent.
14. To convert hexadecimal to binary, convert each hex digit to its 4-bit binary equivalent.
15. Whole numbers (unsigned integers) use all bits for magnitude; for n bits, the range is 0 to $(2^n - 1)$.
16. Signed integers use the Most Significant Bit (MSB) as a sign bit: 0 for positive, 1 for negative.
17. The Two's Complement method is used to represent negative integers: invert all bits of the positive number and add 1 to the result.
18. For an n-bit signed integer using two's complement, the range is -2^{n-1} to $(2^{n-1} - 1)$.
19. Real numbers (with fractions) are represented using floating-point notation: Sign × Mantissa × 2^Exponent.
20. Single-precision floating-point format uses 32 bits: 1 sign bit, 8 exponent bits, and 23 mantissa bits.
21. Double-precision floating-point format uses 64 bits: 1 sign bit, 11 exponent bits, and 52 mantissa bits.
22. To convert a fractional decimal part to binary, multiply the fraction by 2 repeatedly, recording the integer part each time.
23. Binary addition follows the rules: 0+0=0, 0+1=1, 1+0=1, 1+1=0 with a carry of 1.

Practice MCQs

1. What is the key difference between data and information?
a) Data is processed, information is raw.
b) Data is meaningful, information is a collection of facts.
c) Data is raw, information is processed and meaningful.
d) Data is stored electronically, information is printed.
Answer: c) Data is raw, information is processed and meaningful.

2. Which of the following is NOT a step in data manipulation?
a) Classifying
b) Capturing
c) Calculating
d) Summarizing
Answer: b) Capturing

3. Which number system uses a base of 8 and is historically significant for representing 3 binary bits per digit?
a) Decimal
b) Hexadecimal
c) Octal
d) Binary
Answer: c) Octal

4. What is the primary reason computers use the binary number system internally?
a) It is easy for humans to understand.
b) It allows for complex mathematical operations.
c) It aligns with the two stable states (ON/OFF) of transistors in digital circuits.
d) It provides the most compact representation of numbers.
Answer: c) It aligns with the two stable states (ON/OFF) of transistors in digital circuits.

5. To convert the decimal number 29 to binary, what is the correct sequence of remainders from the repeated division-by-2 process?
a) 10111
b) 11101
c) 11011
d) 11110
Answer: b) 11101

6. The binary number 11010101 is equivalent to which hexadecimal number?
a) D5
b) C5
c) D4
d) E5
Answer: a) D5

7. What is the range of values for an 8-bit unsigned integer?
a) -128 to +127
b) 0 to 255
c) -255 to +255
d) 0 to 511
Answer: b) 0 to 255

8. In the two's complement representation, how is the negative equivalent of a positive binary number formed?
a) Invert all bits.
b) Invert all bits and subtract 1.
c) Invert all bits and add 1.
d) Add 1 to the number.
Answer: c) Invert all bits and add 1.

Chapter 5

Operating Systems

Introduction to Software and Operating Systems

What is Software?

Software is a collection of computer programs, procedures, and associated documentation that instructs a computer on what to do and how to do it. Without software, a computer's hardware is a useless collection of electronic components.

Types of Software

Software is broadly classified into two main categories:

1. **System Software:** This software is designed to manage and operate the computer hardware, providing a platform for running application software. It acts as an intermediary between the hardware and the user applications.
   - **Examples:** Operating Systems (Windows, macOS, Linux), Device Drivers (printer, graphics card drivers), Utility Programs (antivirus, disk cleanup, backup tools).
   - **Purpose:** To manage hardware resources and create a stable environment for other software.
2. **Application Software:** This software is designed to help users perform specific tasks or solve particular problems. These programs fulfill user needs directly.
   - **Examples:** Word Processors (Microsoft Word, Google Docs), Web Browsers (Chrome, Firefox), Spreadsheet Software (Microsoft Excel), Graphic Design Software (Adobe Photoshop, GIMP), Games.
   - **Purpose:** To enable users to accomplish productive, creative, or entertainment-oriented tasks.

Key Differences:

- **Control:** System software controls the hardware; application software is controlled by the user to perform tasks.
- **Necessity:** A computer cannot run without system software; application software is optional and installed based on user needs.
- **Installation:** System software (especially the OS) is usually pre-installed; application software is installed by the user.

The history of Windows began in the mid-1980s and has seen many changes in both design and functionality. Windows has developed through decades of innovation, continuously adapting to meet user needs.

Timeline of Key Windows Releases:

Version	Release Year	Highlights
Windows 1.0	1985	First GUI shell for MS-DOS; introduced overlapping windows concept
Windows 3.1	1992	Widely adopted; introduced TrueType fonts, multimedia, and File Manager
Windows 95	1995	Start menu, taskbar, plug-and-play hardware support; major breakthrough
Windows 98	1998	Improved hardware compatibility, better web integration with Internet Explorer
Windows ME	2000	Focused on home users; included System Restore and improved multimedia support
Windows 2000	2000	Built for business users; introduced Active Directory
Windows XP	2001	Highly stable; major redesign, used extensively in homes and businesses
Windows Vista	2007	Introduced Aero Glass interface and better security; known for performance issues
Windows 7	2009	Improved speed and usability; became a very popular version
Windows 8	2012	Introduced tile-based Start screen; designed for touchscreens
Windows 8.1	2013	Refined Windows 8 with better user experience and app integration
Windows 10	2015	Returned to classic Start menu; added Cortana, virtual desktops, regular updates
Windows 11	2021	Modernized interface, centered Start menu, enhanced gaming and productivity

Notable Milestones:

- **Windows 95** introduced the **Start Menu**, revolutionizing navigation
- **Windows XP** ran for more than a decade and was beloved for its stability

One Liners: Operating Systems

1. Software is a collection of computer programs, procedures, and documentation that instructs a computer on what to do and how to do it.
2. Without software, a computer's hardware is a useless collection of electronic components.
3. System Software is designed to manage and operate computer hardware, providing a platform for running application software.
4. System Software acts as an intermediary between hardware and user applications.
5. Examples of System Software include Operating Systems, Device Drivers, and Utility Programs.
6. The purpose of System Software is to manage hardware resources and create a stable environment for other software.
7. Application Software is designed to help users perform specific tasks or solve particular problems.
8. Application Software fulfills user needs directly, such as word processing or web browsing.
9. System Software controls the hardware, whereas Application Software is controlled by the user to perform tasks.
10. A computer cannot run without System Software; Application Software is optional and installed based on user needs.
11. System Software (especially the OS) is usually pre-installed, while Application Software is installed by the user.
12. An Operating System (OS) is the most critical type of System Software, acting as an interface between the user and hardware.
13. The OS controls the execution of all programs and manages the computer's resources.
14. The primary purpose of an OS is to act as a Resource Manager for hardware and software resources (CPU, memory, disk, I/O).
15. An OS provides a User Interface, offering a stable, consistent way for users and applications to interact with hardware.
16. A Command Line Interface (CLI) is a text-based interface where users type specific commands to instruct the computer.
17. CLI is powerful and flexible but has a steep learning curve and requires command memorization.
18. DOS (Disk Operating System) was one of the first widely-installed OS for IBM-compatible PCs, using commands like DIR and COPY.
19. UNIX is a powerful, multi-user, multitasking OS developed at Bell Labs, forming the basis for Linux and macOS.
20. A Menu-Driven Interface (MDI) presents users with a series of screens with list options, requiring no command memorization.
21. MDI is simpler than CLI but less flexible, ideal for systems like ATMs and information kiosks.
22. A Graphical User Interface (GUI) uses graphics (icons, windows, buttons) and is interacted with via a pointing device like a mouse.

Practice MCQs

1. What is the fundamental role of System Software?
a) To help users perform specific tasks like word processing.
b) To manage and operate computer hardware, providing a platform for application software.
c) To provide entertainment and games for users.
d) To connect the computer to the internet.
Answer: b) To manage and operate computer hardware, providing a platform for application software.

2. Which of the following is a key distinction between System Software and Application Software?
a) System Software is optional, Application Software is essential.
b) System Software is installed by the user, Application Software is pre-installed.
c) A computer cannot run without System Software, but Application Software is optional.
d) Application Software controls the hardware directly.
Answer: c) A computer cannot run without System Software, but Application Software is optional.

3. The most critical type of system software that acts as an interface between the user and the computer hardware is the:
a) Device Driver
b) Utility Program
c) Operating System (OS)
d) Compiler
Answer: c) Operating System (OS)

4. Which type of user interface is characterized by a text-based environment where users must type specific commands?
a) Graphical User Interface (GUI)
b) Menu-Driven Interface (MDI)
c) Command Line Interface (CLI)
d) Touch Interface
Answer: c) Command Line Interface (CLI)

5. Which early operating system was one of the first widely-installed for IBM-compatible PCs and used commands like DIR and COPY?
a) UNIX
b) Windows 95
c) DOS (Disk Operating System)
d) macOS
Answer: c) DOS (Disk Operating System)

6. What is a primary advantage of a Graphical User Interface (GUI) over a Command Line Interface (CLI)?
a) It offers more precise control over the file system.
b) It is faster for experienced users to perform complex tasks.
c) It is more user-friendly and easier to learn, using visual recognition.
d) It uses fewer system resources like RAM and CPU.
Answer: c) It is more user-friendly and easier to learn, using visual recognition.

7. An OS that allows only one user to run multiple applications concurrently is classified as:
a) Multi-User, Single-Tasking
b) Single-User, Multitasking
c) Multi-User, Multitasking

Chapter 6

Office Automation

Introduction to Office Automation

Office Automation refers to the use of computer software and systems to digitally create, collect, store, manipulate, and relay office information to accomplish core tasks. The primary applications involved are Word Processors, Spreadsheets, Database Management Systems, and Presentation Software. This chapter provides a comprehensive guide to Word Processing and Spreadsheet software, their features, interfaces, and practical operations.

Word Processing

What is a Word Processor?

A Word Processor is application software used for the composition, editing, formatting, and printing of text-based documents. It goes beyond simple typing by allowing the manipulation of text, insertion of images, sounds, charts, graphics, and even video clips. Documents can be saved in various formats (.txt, .rtf, .html, .doc, .docx) and published on the web with hyperlinks. Its greatest advantage over a typewriter is the ability to make changes without retyping the entire document.

Examples of Word Processing Software: MS Word, WordPerfect, OpenOffice Writer, Google Docs, AbiWord, Apple iWork.

Categories of Word Processors

Text Editors (Simple Word Processors)

These support basic features only. Examples include WordPad and Notepad.
Basic Features:

- **Insert & Delete Text:** Add or erase characters, words, lines, or pages.
- **Cut, Copy & Paste:** Move or duplicate sections of text.
- **Page Size & Margins:** Define page layout; text readjusts automatically.
- **Search & Replace:** Find and optionally replace specific words/phrases.
- **Word Wrap:** Text automatically moves to the next line.

One Liners: Office Automation

1. Office Automation uses computer software to digitally create, collect, store, manipulate, and relay office information to accomplish core tasks.
2. Primary applications of office automation include Word Processors, Spreadsheets, Database Management Systems, and Presentation Software.
3. A Word Processor is application software used for the composition, editing, formatting, and printing of text-based documents.
4. A key advantage of a word processor over a typewriter is the ability to make changes without retyping the entire document.
5. Text Editors (simple word processors) support only basic features like insert, delete, cut, copy, paste, and word wrap.
6. Full-Featured Word Processors support advanced capabilities like mail merge, macros, footnotes, and table of contents generation.
7. The WYSIWYG (What You See Is What You Get) feature ensures the on-screen display matches the printed output.
8. The Title Bar in a word processor window displays the name of the active document and the application.
9. The Ribbon in modern word processors replaced menus and contains tabs grouping related commands.
10. The Quick Access Toolbar is a customizable bar for frequently used commands like Save, Undo, and Redo.
11. The Ruler shows text positioning, tabs, margins, and indents both horizontally and vertically.
12. The Document Window is the main area for creating and editing, with a blinking cursor indicating the insertion point.
13. The Status Bar shows document information such as page number, word count, and zoom level.
14. Ctrl+N is the keyboard shortcut to create a new document in most word processors.
15. Ctrl+S is the shortcut to save a document, while Ctrl+O is used to open an existing document.
16. Ctrl+P opens the Print dialog box for printing a document.
17. In Insert Mode (default), new text pushes existing text forward.
18. In Overtype Mode, new text overwrites existing text at the cursor position.
19. Ctrl+A selects the entire document's content.
20. The Backspace key deletes characters to the left of the cursor, while the Delete key deletes characters to the right.
21. Cut (Ctrl+X), Copy (Ctrl+C), and Paste (Ctrl+V) are used to move or duplicate text via the Clipboard.
22. The Clipboard is a temporary memory space managed by the operating system for transferring data between applications.
23. Undo (Ctrl+Z) reverses the last action, and Redo (Ctrl+Y) reapplies it.
24. Font Formatting involves changing the appearance of characters, including type, size, style, and color.

Practice MCQs

1. What is the primary purpose of Office Automation?
a) To replace human workers entirely
b) To use computer software to digitally create, store, manipulate, and relay office information
c) To design hardware for office use
d) To provide entertainment in the workplace
Answer: b) To use computer software to digitally create, store, manipulate, and relay office information

2. Which of the following is NOT a primary application of office automation?
a) Word Processor
b) Spreadsheet
c) Operating System
d) Database Management System
Answer: c) Operating System

3. The greatest advantage of a word processor over a traditional typewriter is:
a) It is more expensive
b) It makes a louder sound
c) It allows changes without retyping the entire document
d) It uses more paper
Answer: c) It allows changes without retyping the entire document

4. Which word processing feature ensures that the on-screen display exactly matches the printed output?
a) AutoCorrect
b) WYSIWYG (What You See Is What You Get)
c) Word Wrap
d) Mail Merge
Answer: b) WYSIWYG (What You See Is What You Get)

5. In a word processor window, which component is a customizable bar for frequently used commands like Save and Undo?
a) Title Bar
b) Ribbon
c) Quick Access Toolbar
d) Status Bar
Answer: c) Quick Access Toolbar

6. What is the keyboard shortcut to select all text in a document?
a) Ctrl+C
b) Ctrl+V
c) Ctrl+A
d) Ctrl+X
Answer: c) Ctrl+A

7. Which typing mode causes new text to overwrite existing text at the cursor position?
a) Insert Mode
b) Overtype Mode
c) Replace Mode
d) Typeover Mode
Answer: b) Overtype Mode

8. The temporary memory space used by the operating system to hold cut or copied data for pasting is called the:
a) Cache
b) Clipboard
c) RAM
d) Hard Drive
Answer: b) Clipboard

9. Which font type has small decorative strokes at the ends of characters and is generally better for printed body text?
a) Sans-serif
b) Script

Chapter 8

Microsoft Word (MS Word)

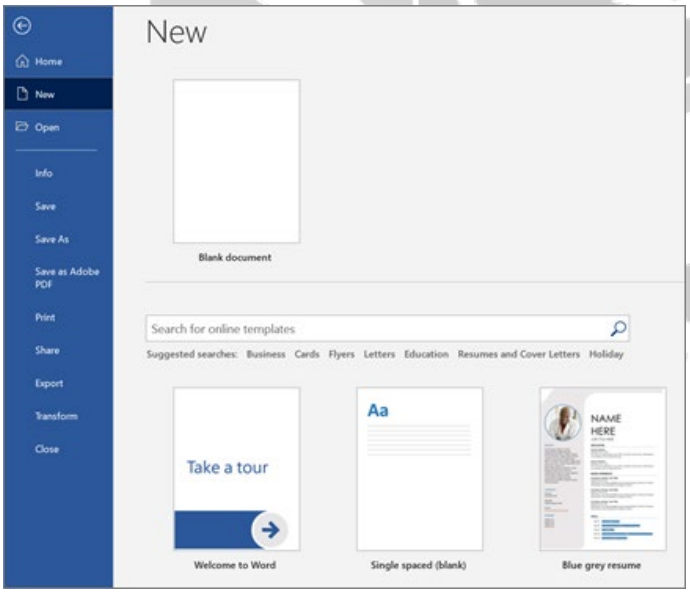
With Word you can:

- Create a document from scratch or from a template .
- Add text, images, art, and videos.
- Research a topic and find credible sources.
- Access your documents from a computer, tablet, or phone via OneDrive.
- Share your documents and collaborate with others.
- Track and review changes.

Create a new document

1. On the **File** tab, select **New.**
2. Select **Blank document,** or double-click a template image or type the kind of document into the **Search for online templates** box and press **Enter.**

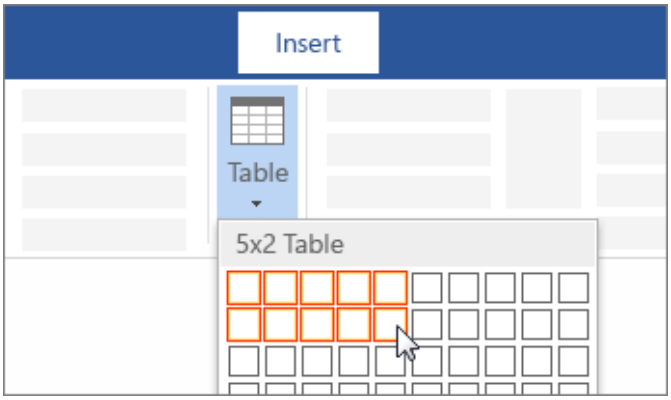
Tip: For practice using Word features, try a learning guide like **Welcome to Word** or **Insert your first table of contents**.



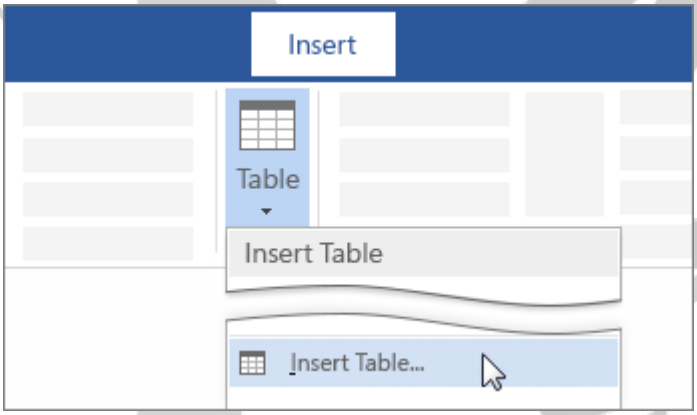
Add and format text

1. Click on your new blank page and type some text.

For a basic table, click **Insert** > **Table** and move the cursor over the grid until you highlight the number of columns and rows you want.



For a larger table, or to customize a table, select **Insert** > **Table** > **Insert Table**.



Tips:

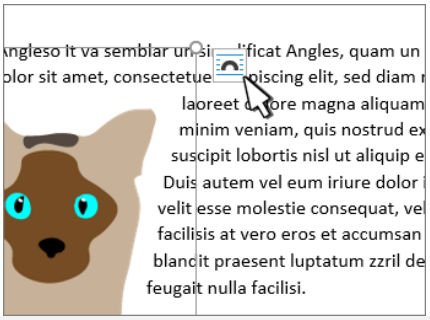
- If you already have text separated by tabs, you can quickly convert it to a table. Select **Insert** > **Table**, and then select **Convert Text to Table**.
- To draw your own table, select **Insert** > **Table** > **Draw Table**

Save a document

Save your document to OneDrive so you can get to it from anywhere – at work, at home, or on the go. Or save to another location, like your desktop.

1. On the **File** tab, select **Save As** or **Save a Copy**.

3. Select the layout you want.



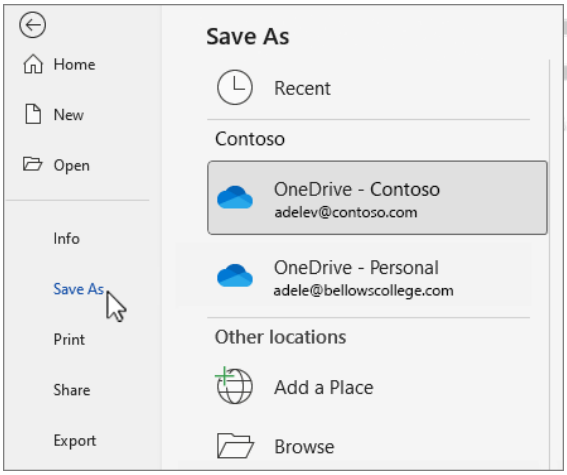
Tip: In Line with Text puts the picture in a paragraph, just as if it were text. The picture will change position as text is added or removed. The other choices let you move the picture around on the page, with text flowing around it.

Save a document

Save your document to OneDrive so you can get to it from anywhere – at work, at home, or on the go. Or save to another location, like your desktop.

1. On the **File** tab, select **Save As** or **Save a Copy**.
2. In the Save dialog, select **OneDrive**.
3. Update the name and file type if you want, and select **Save**.

   Save personal files to **OneDrive - Personal**, and work files to your company OneDrive or SharePoint site.



4. Select **Browse**, and navigate to any location including the Desktop.
5. Enter a name, and select **Save**.

One Liners: MS Word

1. Microsoft Word allows you to create documents from scratch or from an online template.
2. You can research topics and find credible sources directly within Microsoft Word.
3. Documents can be accessed from a computer, tablet, or phone via OneDrive.
4. Word facilitates document sharing and collaboration with others.
5. The Track and Review changes feature is available in Microsoft Word.
6. A new blank document is created from the **File** tab by selecting **New** and then **Blank document**.
7. To create a document from a template, you can double-click a template image or search in the **Search for online templates** box.
8. Learning guides like **Welcome to Word** are available for practice with Word features.
9. Text is formatted using options on the **Home** tab such as **Bold**, **Italic**, **Bullets**, and **Numbering**.
10. The **Insert** tab is used to add elements like Tables, Pictures, Shapes, SmartArt, Charts, and Screenshots.
11. A table is inserted by selecting **Insert > Table** and hovering over a grid to choose the number of rows and columns.
12. For a larger or customized table, use **Insert > Table > Insert Table**.
13. Existing text separated by tabs can be converted to a table using **Insert > Table > Convert Text to Table**.
14. You can draw a custom table using **Insert > Table > Draw Table**.
15. To add text, place the cursor at the desired location and start typing.
16. To replace text, select it and start typing; double-click selects a single word.
17. Clicking to the left of a line selects the entire line.
18. Text formatting can be applied from the pop-up toolbar or the **Home** tab's Font group.
19. The Format Painter tool copies formatting from one text selection to another.
20. Double-clicking the Format Painter allows copying formatting to multiple locations.
21. To save a document to OneDrive, use **File > Save As** or **Save a Copy** and select **OneDrive**.
22. Save personal files to **OneDrive - Personal** and work files to your company's OneDrive or SharePoint site.
23. You can also save a document to other locations like the Desktop by selecting **Browse**.
24. AutoSave automatically saves changes when a document is stored in OneDrive or SharePoint.
25. AutoSave can be toggled on or off from the Quick Access Toolbar.
26. The Quick Access Toolbar can be shown by right-clicking the ribbon and selecting **Show Quick Access Toolbar**.
27. Pictures can be inserted from your PC (**This Device**), from Stock Images, or from the web (**Online Pictures**).
28. In older Word versions, the option for online pictures may be labeled **Online Pictures** next to **Pictures**.
29. To resize a picture, select it and drag a corner handle.

Practice MCQs

1. In Microsoft Word, where do you go to create a brand new document from a blank slate?
a) Home > New
b) File > New > Blank document
c) Insert > New Document
d) View > New Window
Answer: b) File > New > Blank document

2. Which feature in Word allows you to automatically save changes when your document is stored on OneDrive?
a) AutoRecover
b) Quick Save
c) AutoSave
d) Background Save
Answer: c) AutoSave

3. To quickly convert text separated by tabs into a structured table, which command should you use?
a) Insert > Table > Draw Table
b) Insert > Table > Excel Spreadsheet
c) Insert > Table > Convert Text to Table
d) Layout > Convert > Text to Table
Answer: c) Insert > Table > Convert Text to Table

4. What is the primary function of the Format Painter tool in Word?
a) To change the page color
b) To copy formatting from one text selection to another
c) To insert painterly art effects
d) To adjust paragraph spacing
Answer: b) To copy formatting from one text selection to another

5. How do you ensure that the header on the first page of your document is different from the rest (e.g., blank)?
a) Delete the header on the first page manually.
b) Insert a section break after the first page.
c) Check the **Different First Page** box in the Header & Footer Tools.
d) Use **File > Options** to disable the first page header.
Answer: c) Check the Different First Page box in the Header & Footer Tools.

6. When inserting a picture, which text wrapping option places the picture within the text paragraph, causing it to move as text is edited?
a) Square
b) Tight
c) Behind Text
d) In Line with Text
Answer: d) In Line with Text

7. You want to start page numbering from "1" on the second page of your document. What should you set the "Start at" value to in the Page Number Format dialog?
a) 1
b) 0
c) 2
d) -1
Answer: b) 0

8. To create a custom watermark using your company logo, which sequence of commands do you follow?
a) Design > Watermark > Custom Watermark > Picture watermark
b) Insert > Picture > Set as Watermark
c) Page Layout > Background > Custom Watermark
d) View > Watermark > Insert Picture
Answer: a) Design > Watermark >

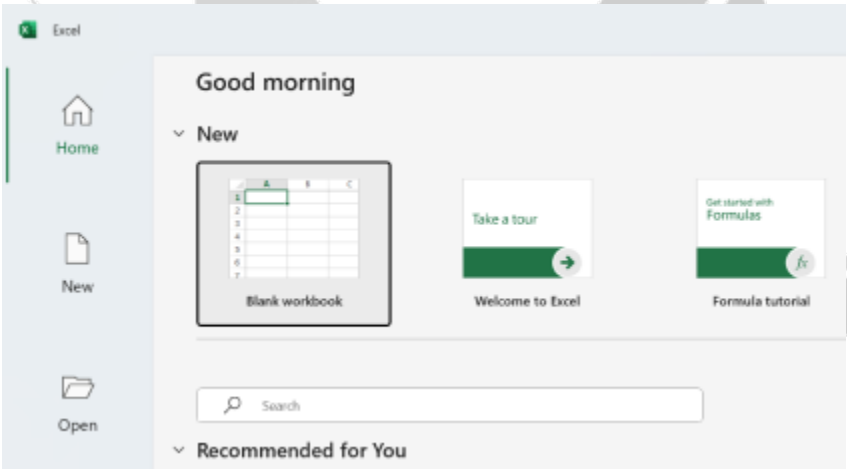
Microsoft Excel (MS Excel)

What is Excel?

Excel makes it easy to crunch numbers. With Excel, you can streamline data entry with AutoFill. Then, get chart recommendations based on your data, and create them with one click. Or easily spot trends and patterns with data bars, color coding, and icons.

Create a workbook

1. Open Excel.
2. Select **Blank workbook**. Or press **Ctrl+N**.



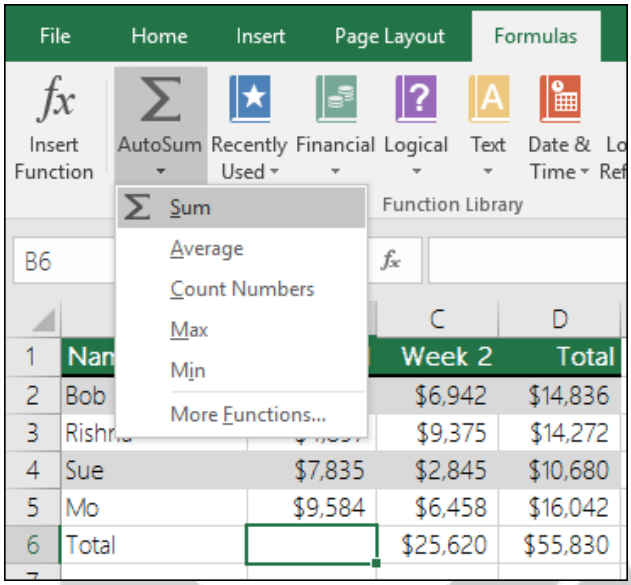
Enter data

To manually enter data:

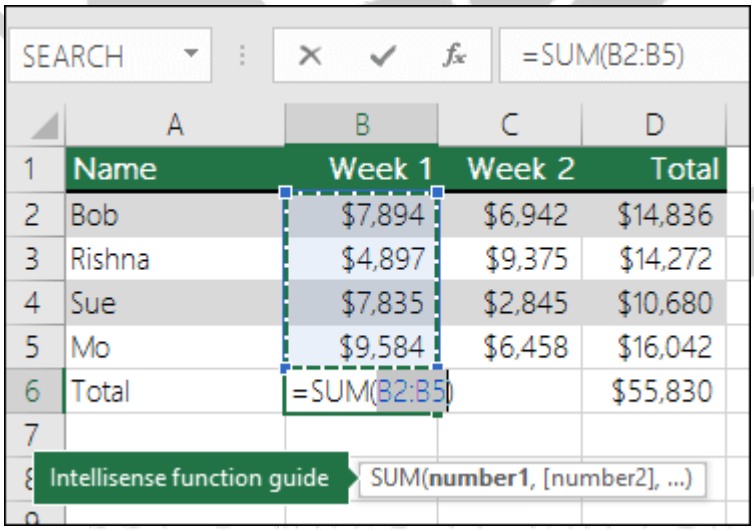
1. Select an empty cell, such as A1, and then type text or a number.
2. Press **Enter** or **Tab** to move to the next cell.

To fill data in a series:

1. Enter the beginning of the series in two cells: such as Jan and Feb; or 2014 and 2015.



AutoSum vertically



In the figure above, the AutoSum feature is seen to automatically detect cells B2:B5 as the range to sum. All you need to do is press ENTER to confirm it. If you need to add/exclude more cells, you can hold the Shift Key + the arrow key of your choice until your selection matches what you want. Then press Enter to complete the task.

Intelligence function guide: the SUM(number1,[number2], …) floating tag beneath the function is its Intelligence guide. If you click the SUM or function name, it will change o a blue hyperlink to the Help topic for that function. If you click the individual function elements, their representative pieces in the formula will be highlighted. In this case, only B2:B5 would be highlighted, since there is only one number reference in this formula. The Intellisense tag will appear for any function.

When you copy the formula, ensure that the cell references are correct. Cell references may change if they have relative references.

What can I use in a formula to mimic calculator keys?

Calculator key	Excel method	Description, example	Result
+ (Plus key)	+ (plus)	Use in a formula to add numbers. Example: =4+6+2	12
- (Minus key)	- (minus)	Use in a formula to subtract numbers or to signify a negative number. Example: =18-12 Example: =24*-5 (24 times negative 5)	6 -120
x (Multiply key)	* (asterisk; also called "star")	Use in a formula to multiply numbers. Example: =8*3	24
÷ (Divide key)	/ (forward slash)	Use in a formula to divide one number by another. Example: =45/5	9
% (Percent key)	% (percent)	Use in a formula with * to multiply by a percent. Example: =15%*20	3
√ (square root)	SQRT (function)	Use the SQRT function in a formula to find the square root of a number. Example: =SQRT(64)	8
1/x (reciprocal)	=1/n	Use =1/*n* in a formula, where *n* is the number you want to divide 1 by. Example: =1/8	0.125

Add a watermark in Excel

You can use an image, such as a logo, to insert as a watermark that will appear on the spreadsheet along with the displayed data.

Create a watermark

1. Select **Insert** > **Header & Footer**.
2. Tap on the header and on the **Header & Footer Elements** tab on the ribbon, click **Picture**.
3. Select one of the available options to insert your image. In the header, you'll see **& [Picture]**.
4. Tap anywhere outside the header to see the watermark.

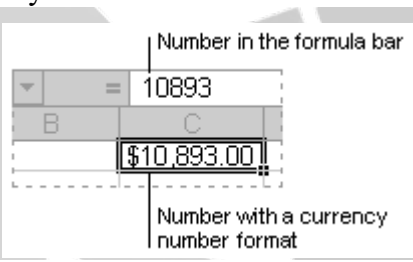
2. Select **Insert** > **Recommended Charts**.
3. Select a chart on the **Recommended Charts** tab, to preview the chart.
4. Select a chart.
5. Select **OK**.

Add a trendline

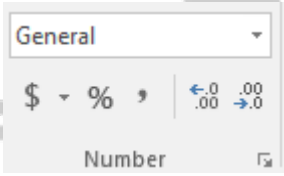
1. Select a chart.
2. Select **Chart Design** > **Add Chart Element**.
3. Select **Trendline** and then select the type of trendline you want, such as **Linear, Exponential, Linear Forecast**, or **Moving Average**.

Available number formats in Excel

In Excel, you can format numbers in cells for things like currency, percentages, decimals, dates, phone numbers, or social security numbers.



1. Select a cell or a cell range.
2. On the **Home** tab, select **Number** from the drop-down.



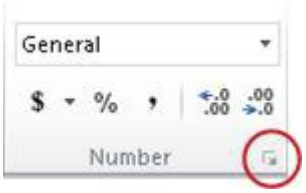
Or, you can choose one of these options:

- Press CTRL + 1 and select **Number**.
- Right-click the cell or cell range, select **Format Cells…** , and select **Number**.
- Select the small arrow, dialog box launcher, and then select **Number**.

3. Select the format you want.

Number formats

To see all available number formats, select the Dialog Box Launcher next to **Number** on



the **Home** tab in the **Number** group.

Format	Description
General	The default number format that Excel applies when you type a number. For the most part, numbers that are formatted with the **General** format are displayed just the way you type them. However, if the cell is not wide enough to show the entire number, the **General** format rounds the numbers with decimals. The **General** number format also uses scientific (exponential) notation for large numbers (12 or more digits).
Number	Used for the general display of numbers. You can specify the number of decimal places that you want to use, whether you want to use a thousands separator, and how you want to display negative numbers.
Currency	Used for general monetary values and displays the default currency symbol with numbers. You can specify the number of decimal places that you want to use, whether you want to use a thousands separator, and how you want to display negative numbers.
Accounting	Also used for monetary values, but it aligns the currency symbols and decimal points of numbers in a column.
Date	Displays date and time serial numbers as date values, according to the type and locale (location) that you specify. Date formats that begin with an asterisk (*) respond to changes in regional date and time settings that are specified in Control Panel. Formats without an asterisk are not affected by Control Panel settings.

In general, it's best to place constants in individual cells where they can be easily changed if needed, then reference those cells in formulas.

Using references in Excel formulas

A reference identifies a cell or a range of cells on a worksheet, and tells Excel where to look for the values or data you want to use in a formula. You can use references to use data contained in different parts of a worksheet in one formula or use the value from one cell in several formulas. You can also refer to cells on other sheets in the same workbook, and to other workbooks. References to cells in other workbooks are called links or external references.

The A1 reference style

By default, Excel uses the A1 reference style, which refers to columns with letters (A through XFD, for a total of 16,384 columns) and refers to rows with numbers (1 through 1,048,576). These letters and numbers are called row and column headings. To refer to a cell, enter the column letter followed by the row number. For example, B2 refers to the cell at the intersection of column B and row 2.

To refer to	Use
The cell in column A and row 10	A10
The range of cells in column A and rows 10 through 20	A10:A20
The range of cells in row 15 and columns B through E	B15:E15
All cells in row 5	5:5
All cells in rows 5 through 10	5:10
All cells in column H	H:H
All cells in columns H through J	H:J
The range of cells in columns A through E and rows 10 through 20	A10:E20

Some Sample Formulas

Basic Formulas

Formula	Structure	Explanation
AVERAGE	=AVERAGE(A2:A10)	Returns a mathematical average of a given cell range
COUNT	=COUNT(A2:A10)	Returns the count of the numbers in given cell range
MAX	=MAX(A2:A10)	Finds the largest value in a given cell range
MEDIAN	=MEDIAN(A2:A10)	Returns the median value, or middle value, in a given cell range
MIN	=MIN(A2:A10)	Finds the smallest value in a given cell range
SUM	=SUM(A2:A10)	Totals numbers in a given cell range

Cell range A2:A10 is used above to indicate that each formula uses a cell range as it arguments

Time Formulas

Formula	Structure	Explanation
TODAY	=TODAY()	Volatile – takes no arguments – returns today's date
NOW	=NOW()	Volatile – takes no arguments – returns today's date and time
DATEDIF	=DATEDIF(Start Date, End Date, Unit)	Returns the number of years, months or days between two dates • Start Date – date furthest in the past • Unit could be "Y" for years, "M" for months or "D" for days • Units must be in double quotes • This formula is NOT in the function library
YEAR	=YEAR(Date)	• Returns the year portion of date • Example =YEAR(7/16/2005) would return 2005
MONTH	=MONTH(Date)	• Returns the month portion of date • Example =MONTH(7/16/2005) would return 7
DAY	=DAY(Date)	• Returns the day portion of date • Example =DAY(7/16/2005) would return 16

Use a time formula and get an answer you didn't expect? If you got a date and were expecting a number, remember to change the formatting from date to number. If you got a number and were expecting a date, change the formatting to date

One Liners: MS Excel

1. Excel simplifies numerical calculations and data entry with features like AutoFill.
2. Chart recommendations based on your data can be created with a single click in Excel.
3. Trends and patterns can be easily visualized using data bars, color coding, and icons in Excel.
4. A new blank workbook is created by selecting **Blank workbook** or pressing **Ctrl+N**.
5. To enter data manually, select a cell, type, and press **Enter** or **Tab** to move to the next cell.
6. The AutoFill series is created by entering the start of the series in two cells and dragging the fill handle.
7. Excel can perform calculations using simple formulas for addition, subtraction, multiplication, and division.
8. All Excel formulas must begin with an equal sign (=).
9. The basic arithmetic operators are: plus (+) for addition, minus (-) for subtraction, asterisk (*) for multiplication, and forward slash (/) for division.
10. There is no dedicated **SUBTRACT** function in Excel; the minus operator (-) is used within a formula.
11. The **SUM** function can incorporate negative numbers using a minus sign, e.g., =SUM(12,5,-3,8,-4).
12. The **AutoSum** feature automatically senses a contiguous range and inserts a SUM formula.
13. **AutoSum** can be applied both vertically (above/below a range) and horizontally (left/right of a range).
14. **AutoSum does not work on non-contiguous ranges** of cells.
15. The Intellisense guide for a function appears as a floating tag and provides a hyperlink to its Help topic.
16. After creating a formula, you can copy it to adjacent cells to avoid rewriting it.
17. When a formula with relative references is copied, the cell references update automatically relative to their new position.

Practice MCQs

1. Which keyboard shortcut is used to create a new blank workbook in Excel?
   a) Ctrl+B
   b) Ctrl+N
   c) Ctrl+W
   d) Ctrl+T
   Answer: b) Ctrl+N

2. To automatically fill a series like "Jan, Feb, Mar..." what must you do first?
   a) Type the entire series once.
   b) Use the Fill Series dialog box.
   c) Enter the beginning of the series in two cells and select them.
   d) Select the cells and choose "Fill Series" from the Data tab.
   Answer: c) Enter the beginning of the series in two cells and select them.

3. What is a fundamental requirement for every Excel formula?
   a) It must contain a function.
   b) It must reference another cell.
   c) It must begin with an equal sign (=).
   d) It must be enclosed in parentheses.
   Answer: c) It must begin with an equal sign (=).

4. How does Excel handle subtraction within a formula, given there is no SUBTRACT function?
   a) It uses the SUM function with negative numbers.
   b) It uses the DIF function.
   c) It uses the minus (-) operator.
   d) Both a and c are correct.
   Answer: d) Both a and c are correct.

5. The AutoSum feature is designed to work with which type of cell ranges?
   a) 3-D references
   b) Non-contiguous ranges
   c) Contiguous ranges
   d) Array ranges
   Answer: c) Contiguous ranges

6. When you copy a formula containing a relative cell reference like =A1 to the cell one column to the right, what does it become?
   a) =A1
   b) =A1
   c) =B1
   d) =A2
   Answer: c) =B1

7. In Excel, which function is equivalent to the calculator's square root (√) key?
   a) SQR
   b) ROOT
   c) SQRT
   d) POWER(...,0.5)
   Answer: c) SQRT

8. Where is a watermark picture inserted in an Excel worksheet to appear behind the data?
   a) As a background from the Page Layout tab.
   b) Into the header or footer via Insert > Header & Footer.
   c) As an inline image on the worksheet.
   d) Using the Watermark option on the Design tab.
   Answer: b) Into the header or footer via Insert > Header & Footer.

9. What happens to the contents of cells B2, C2, and D2 when they are merged into one cell?
   a) All contents are concatenated.
   b) Only the content of the upper-left cell (B2) is kept.
   c) The contents are averaged.
   d) An error message appears.

Chapter 9

Microsoft PowerPoint (MS PowerPoint)

What is PowerPoint?

Overview

With PowerPoint on your PC, Mac, or mobile device, you can:

- Create presentations from scratch or a template.
- Add text, images, art, and videos.
- Select a professional design with PowerPoint Designer.
- Add transitions, animations, and cinematic motion.
- Save to OneDrive, to get to your presentations from your computer, tablet, or phone.
- Share your work and work with others, wherever they are.

Create a presentation in PowerPoint

Create presentations from scratch or start with a professionally designed, fully customizable template from Microsoft Create.

Tip: If you have Microsoft Copilot it can help you create a presentation, add slides or images, and more. To learn more see Create a new presentation with Copilot in PowerPoint.

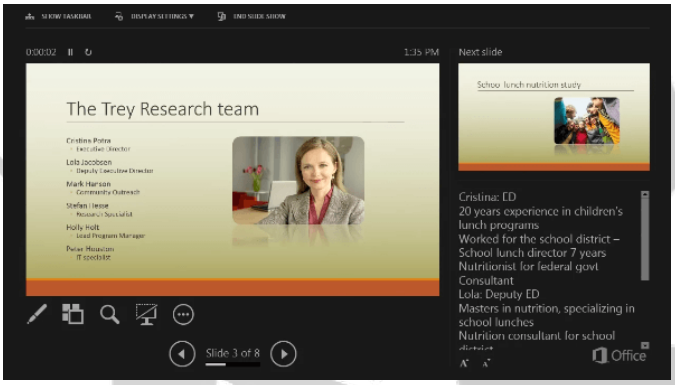
Create a presentation

1. Open PowerPoint.
2. In the left pane, select **New**.
3. Select an option:
   - To create a presentation from scratch, select **Blank Presentation**.
   - To use a prepared design, select one of the templates.

Give a presentation in PowerPoint

Start a presentation

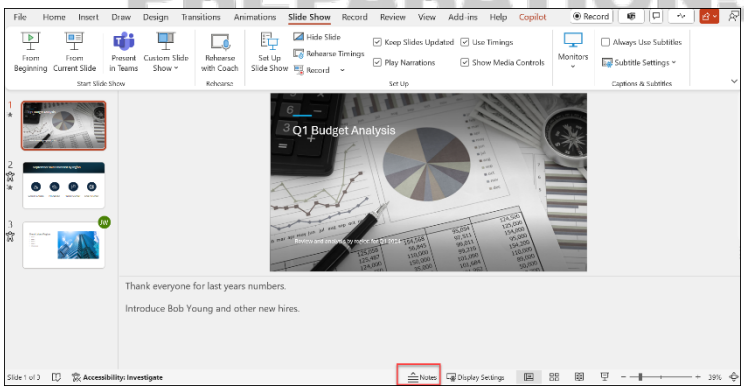
- On the **Slide Show** tab select **From Beginning**. Now, if you are working with PowerPoint on a single monitor and you want to display Presenter view, in **Slide Show** view, on the control bar at the bottom left select the three dots, and then **Show Presenter View**.
- To move to the previous or next slide, select **Previous** or **Next**.
- To view all the slides in your presentation, select **See all slides**.



Notes

During your presentation, the speaker notes are visible on your monitor, but aren't visible to the audience.

- The Notes pane is a box that appears below each slide. Tap it to add notes.



-
- If you don't see the Notes pane or it is completely minimized, click **Notes** on the task bar across the bottom of the PowerPoint window

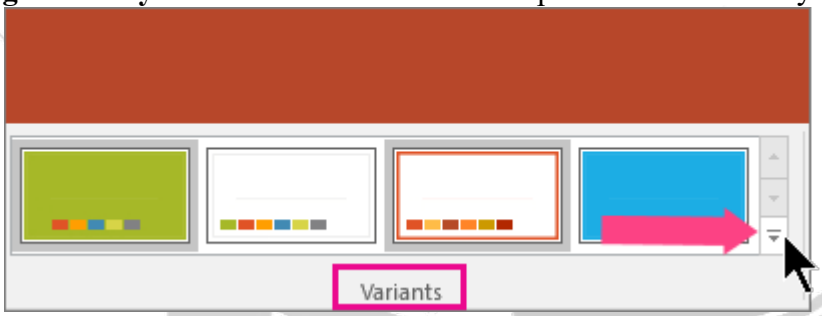
2. If offered, choose a color variation, and then select **Create**.

If you change your mind, you can always change the theme or variant later on the **Design** tab.

1. On the **Design** tab, pick a theme with the colors, fonts, and effects that you like.

2. To apply a different color variation of a particular theme, in the **Variants** group, pick a variant.
   Note: If you don't see any variants, it could be because you're using a custom theme, an older theme designed for earlier versions of PowerPoint, or because you imported some slides from another presentation with an older or custom theme.

3. Select right arrow in the Variants group to select different **Colors**, **Fonts**, **Effects**, or **Background Styles** and choose from built-in options or customize your own.



Create and save a custom theme

You can create a custom theme by modifying an existing theme or by starting from scratch with a blank presentation.

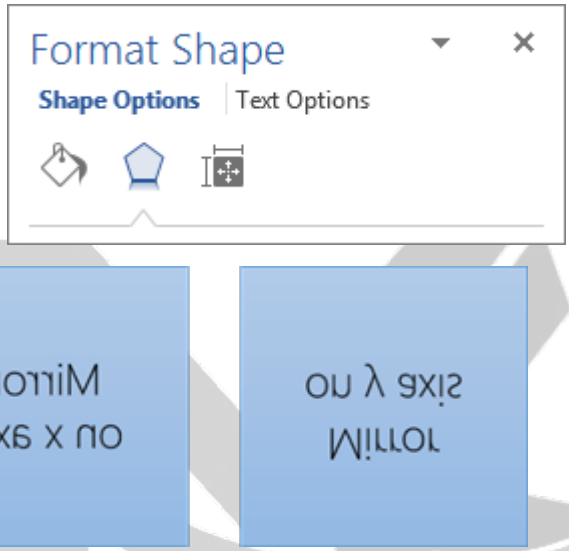
1. Select your first slide, and then on the **Design** tab, select the down arrow in the Variants group.
2. Select **Colors**, **Fonts**, **Effects**, or **Background Styles** and choose from built-in options or customize your own.
3. When you're done customizing styles, select the down arrow in the **Themes** group, and then select **Save Current Theme**.
4. Give your theme a name, and select **Save**. By default, it is save with your other PowerPoint themes and will be available in the **Themes** group under a **Custom** header.

Change the page orientation in PowerPoint between landscape and portrait

PowerPoint slides are automatically set up in *landscape* (horizontal) layout  , but you can change the slide orientation to *portrait* (vertical) layout  .

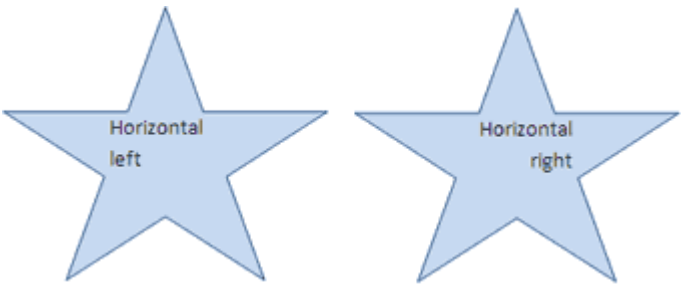
Rotate (mirror) text in a shape or text box

1. Insert a text box or shape in your document, and then type and format your text.
2. Right-click the box or shape and select **Format Shape**.
3. In the **Format Shape** pane, under **Shape Options**, select **Effects**.



4. Under **3-D Rotation** , in the **X Rotation** or **Y Rotation** box, enter 180 .
5. (Optional) If your text box becomes filled with a color, you can remove the color in the **Format Shape** pane. Under **Shape Options** , click the **Fill & Line** tab , expand **Fill** , and select **No fill** .
6. (Optional) To remove the text box outline, right-click the text box, click **Outline** in the mini toolbar that appears, and choose **No Outline** .

Position text horizontally in a shape or text box



One Liners: MS Power Point

1. PowerPoint allows you to create presentations from scratch or from professionally designed templates.
2. With Microsoft Copilot, you can get assistance creating presentations, adding slides, images, and more.
3. To create a new presentation, open PowerPoint, select **New** in the left pane, and choose **Blank Presentation** or a template.
4. The **Take a Tour** option provides tips for using PowerPoint.
5. A new slide is added by selecting a slide in the thumbnail pane, then going to **Home > Slides > New Slide**.
6. The layout for a new slide is chosen from the **Layout** menu in the **Slides** section on the **Home** tab.
7. Text is formatted using options like **Font**, **Bold**, **Italic**, **Increase Font Size**, and **Decrease Font Size** in the **Home** tab's **Font** section.
8. Bulleted or numbered lists are created by selecting text and choosing **Bullets** or **Numbering** on the **Home** tab.
9. Pictures are inserted from the **Insert** tab, **Images** section, by selecting **Pictures** and choosing a source.
10. Illustrations such as **Shapes**, **Icons**, **3D Models**, **SmartArt**, and **Charts** are inserted from the **Illustrations** section of the **Insert** tab.
11. To save a presentation to the cloud for access and collaboration, use **File > Save As** and select **OneDrive**.
12. Save personal files to **OneDrive - Personal** and work files to your company OneDrive.
13. **AutoSave** is always on when you're online and saves changes as you work; pending changes sync when you reconnect.
14. **Themes** and their **Variants** are applied from the **Design** tab.
15. **PowerPoint Designer** suggests design ideas when you insert pictures, a list, or dates; it opens automatically.

Practice MCQs

1. What is the primary purpose of Microsoft Copilot in PowerPoint as mentioned in the chapter?
   a) To design custom animations
   b) To help create presentations, add slides or images, and more
   c) To automatically record narration
   d) To convert presentations to video
   Answer: b) To help create presentations, add slides or images, and more

2. Where is the "Take a Tour" option located when creating a new presentation?
   a) On the **Design** tab
   b) In the **New** pane after selecting **Blank Presentation**
   c) Under **File > Options**
   d) On the **Slide Show** tab
   Answer: b) In the New pane after selecting Blank Presentation

3. To apply a professional design suggestion automatically after inserting a picture, which feature should you use?
   a) Slide Master
   b) Transitions
   c) PowerPoint Designer
   d) Animation Painter
   Answer: c) PowerPoint Designer

4. How do you access the **Presenter View** when running a slide show on a single monitor?
   a) Press F5
   b) Select **Slide Show > Presenter View**
   c) Click the three dots (...) on the control bar in Slide Show view
   d) It automatically appears if notes are added
   Answer: c) Click the three dots (...) on the control bar in Slide Show view

5. If you want a company logo to appear on every slide in the same position, where should you place it?
   a) On the first slide only
   b) On the **Slide Master**
   c) As a watermark from the **Design** tab
   d) In the **Header & Footer** dialog
   Answer: b) On the Slide Master

6. What happens when you edit a layout master in Slide Master view?
   a) Only new slides based on that layout will reflect the changes.
   b) All existing slides immediately update.
   c) Only the title slide changes.
   d) You must manually update each slide.
   Answer: a) Only new slides based on that layout will reflect the changes.

7. Which of the following is **NOT** a standard method to delete a sequence of contiguous slides?
   a) Press Shift, select the first and last slides, right-click, choose Delete Slide.
   b) Press Ctrl, select each slide individually, right-click, choose Delete Slide.
   c) Go to Slide Sorter view, select the slides, and press Delete.
   d) The chapter does not mention using the Delete key.
   Answer: b) Press Ctrl, select each slide individually, right-click, choose Delete Slide. (This is for non-adjacent slides)

Chapter 10

Key-Board and Shortcut Keys

What is KEYBOARD?

- A panel/plate/board of keys that operates a computer or typewriters.
- A piece of computer hardware used to input text, characters, and other commands into a computer or similar device

Control keys
Function keys
Typing (alphanumeric) keys
Navigation keys
Numeric keypad
Indicator lights

Types of Keys Setup on Keyboard:

Keyboard Shortcut keys:

1. **Set of one or more keys that generates a particular command to be executed.**
2. Generally executed by using **Alt or Ctrl keys** with some other keys
3. A **plus (+) sign** between two or more keys indicates that these keys should pressed in combination. For example Ctrl+Shift+A means to press and hold Ctrl and Shift and then press A

Frequently used Keys:

Key	Function
Alt Key	• Key modifier that enables a different input
Escape (esc) key	• Cancel the current operation • Exit the currant window
Space bar	• Move the curser one space forward
Tab Key	• Move the cursor several space foreword • Move to next text box on a form or on a table
Control (ctrl) Key	• Modifer key • Pressed in conjuction with another key performed a specific task
Back Space Key	Move the curser one space backward
Enter Key	• Move the curser to the beginning of the next line • In a dialogue box enable the highlighted option • In some program start the next operation or confirm the current operation

Microsoft Power Point Shortcut Keys

Shortcut Keys	Operation
12	Save As.
Alt + F4	Close PowerPoint
Ctrl + M	Insert a new slide.
Ctrl + D	Duplicate the selected slide.
Ctrl + Shift + D	Duplicate the selected slide.
Page Up/Down	Navigate to the previous/next slide
Ctrl + G	Group objects.
Ctrl + Spacebar	Reset manual character formatting
Shift + F3	Change the case of selected text.
Alt + Q	"Tell me what you want to do".
Ctrl + T	Open the Font window.
Ctrl + K	Insert a hyperlink.
Ctrl + Tab	Switch between open presentations.
Alt + F9	Show/hide gridlines and guides
Alt + F10	Show/hide selection pane.

Alt + N	Access the Insert tab.
Alt + H	Access the Home tab.
Esc	End the slideshow.
Shift + F5	Start the slideshow from the current slide.
F5	Start the slideshow from the beginning.
Ctrl + Move Item with Mouse	Duplicate the item
Shift + Select Item with Mouse	Add to selection.
Ctrl + Shift + G	Ungroup objects.

Tip: Basic text editing and formatting shortcut keys for MS word is same for MS Excel and MS Power Point.

Outlook Shortcut Keys

Shortcut Keys	Operation
Alt + S	Send the E-mail
Ctrl + C	Copy selected text
Ctrl + X	Cut selected text
Ctrl + P	Open Print dialogue box
Ctrl + K	Complete name/E-mail type in address bar
Ctrl + B	Bold highlighted selection
Ctrl + I	Italicized highlighted selection
Ctrl + U	Underline highlighted selection

PDF	Portable Document Format	TCPIP	Transmission control protocol internet protocol
PING	Packet Internet Groper	URL	Uniform resource locater
RAM	Random Access Memory	USB	Universal Serial Bus
VGA	Video Graphic Array	HDD	Hard Disk Drive
HDMI	High Definition Media Interface	MP3	MPEG (Motion picture Expert Group) layer 3
Wifi	Wireless Fidelity	MS	Microsoft
WLAN	Wireless Local Area Network	OS	Operating System
AVI	Audio Video Interleave	RGB	Red, Green, Blue
ALU	Arithmetic logic Unit	DSL	Digital Subscriber Line

Computer memory units:

Basic memory unit	1 Bit
8 bits	1 Byte
1024 Byte	1 Kilobytes (KB)
1024 Kilobytes	1 Megabytes (1MB)
1024 Megabytes	1 Gigabytes (1GB)
1024 Gigabytes	1 Terabyte (TB)
1024 Terabyte	1 Petabyte (1PB)
1024 Petabytes	1 Exabyte (EB)

One Liners: Keyboard and shortcut Keys

1. A keyboard is a panel of keys used to operate a computer or typewriter.
2. A keyboard is a piece of computer hardware used to input text, characters, and other commands.
3. Keyboard shortcut keys are a set of one or more keys that generate a particular command to be executed.
4. Shortcut keys are generally executed by using the Alt or Ctrl keys in combination with other keys.
5. A plus (+) sign between keys indicates that those keys should be pressed in combination.
6. Ctrl+Shift+A means press and hold Ctrl and Shift, then press A.
7. The Alt key is a key modifier that enables a different input.
8. The Escape (Esc) key cancels the current operation or exits the current window.
9. The Spacebar moves the cursor one space forward.
10. The Tab key moves the cursor several spaces forward or to the next text box on a form.
11. The Control (Ctrl) key is a modifier key pressed in conjunction with another key to perform a specific task.
12. The Backspace key moves the cursor one space backward.
13. The Enter key moves the cursor to the beginning of the next line.
14. The Enter key enables the highlighted option in a dialogue box.

177. Win + R opens the Run dialogue box.

178. Win + S opens the search window.

179. Win + T cycles through apps on the taskbar (focus of taskbar).

180. Win + F1 opens the Microsoft Windows help and support center.

181. Win + Left Arrow snaps the File Explorer window to the left side of the screen.

182. Win + Right Arrow snaps the File Explorer window to the right side of the screen.

183. Win + X opens the hidden menu.

184. Win + Tab opens the Task View.

185. Win + Prt Sc saves a screenshot in the Pictures folder.

186. Win + Ctrl + Left/Right Arrow switches between virtual desktop screens.

187. Win + Ctrl + D adds a new virtual desktop.

188. Win + +/- zooms in or out in Magnifier.

189. Win + Esc exits Magnifier.

190. Win + D brings the desktop to the top of other windows.

191. Win + Shift + M undoes the actions done by minimizing all windows.

192. Win + E opens Microsoft Explorer.

193. Win + Tab cycles through open programs on the taskbar.

194. Win + F displays the Windows search/find feature.

Practice MCQs

1. What is the primary function of a keyboard?
   a) Display visual output
   b) Input text and commands
   c) Process data
   d) Store files
   Answer: b) Input text and commands
2. In the shortcut notation "Ctrl+Shift+A", the plus sign (+) indicates:
   a) Press keys one after the other
   b) Press keys in sequence slowly
   c) Press and hold keys in combination
   d) Press the keys only once
   Answer: c) Press and hold keys in combination
3. Which key is used to cancel the current operation or exit a window?
   a) Tab
   b) Alt
   c) Escape (Esc)
   d) Spacebar
   Answer: c) Escape (Esc)
4. The function of the Tab key is NOT to:
   a) Move the cursor several spaces forward
   b) Move to the next text box on a form
   c) Move the cursor one space forward
   d) Navigate within a table
   Answer: c) Move the cursor one space forward
5. What is the role of the Ctrl key?
   a) To type uppercase letters
   b) To move the cursor backward
   c) As a modifier key pressed with another key for a task
   d) To open the Start menu
   Answer: c) As a modifier key pressed with another key for a task
6. Pressing Shift + F10 in Windows performs which action?
   a) Opens the Run dialog
   b) Saves the document
   c) Simulates a right-click
   d) Refreshes the page
   Answer: c) Simulates a right-click
7. In Microsoft Word, which shortcut changes text to Heading 2?
   a) Ctrl + Alt + 1
   b) Ctrl + Alt + 2
   c) Ctrl + Alt + 3
   d) Ctrl + Alt + H
   Answer: b) Ctrl + Alt + 2

Chapter 11

Data Communication and Networks

Introduction to Data Communication

We live in an era of an electronic global village, where computers, telephones, and wireless devices are interconnected worldwide. Data communication is the electronic exchange of data between two devices via a transmission medium such as a wire cable or wireless system. It enables the transfer of information from one location to another, forming the backbone of modern connectivity, collaboration, and information sharing.

Components of Data Communication

A data communication system consists of five fundamental components that work together to enable the transfer of information.

Message

The message is the information or data to be communicated. It can consist of text, numbers, pictures, sound, video, or any combination of these.

Sender (Transmitter/Source)

The sender is the device that originates and sends the data message. It can be a computer, workstation, telephone handset, video camera, mobile phone, or radio/TV station. The transmitter converts the message into a signal suitable for transmission over the chosen medium.

Receiver (Sink/Destination)

The receiver is the device that accepts the transmitted message. It can be a computer, workstation, telephone, television, printer, or fax machine. The receiver converts the received signal back into a form usable by the destination.

Transmission Medium (Channel)

The transmission medium is the physical path or channel through which the message travels from the sender to the receiver. It can be a **guided (wired/bounded)** medium like a cable or an **unguided (wireless/unbounded)** medium like air or space.

Protocol

Need for Standards

Standards provide common guidelines for manufacturers and vendors to ensure interoperability between different hardware and software. They define how devices identify each other, format data, and manage communication. Examples include IEEE 802 series (Ethernet, Wi-Fi), and protocols like TCP/IP.

The OSI (Open Systems Interconnection) Reference Model

Developed by ISO, the OSI model is a **conceptual framework** that standardizes the functions of a telecommunication or computing system into seven distinct layers. Each layer serves the layer above it and is served by the layer below it.

Layer	Name	Function	Protocols/Devices	PDU (Protocol Data Unit)
7	**Application**	Provides network services directly to user applications (email, file transfer).	HTTP, FTP, SMTP, DNS, Telnet	Data/Message
6	**Presentation**	Translates, encrypts, and compresses data for the application layer.	SSL/TLS, JPEG, MPEG, ASCII to EBCDIC conversion	Data/Message
5	**Session**	Establishes, manages, and terminates connections (sessions) between applications.	NetBIOS, RPC, SIP	Data/Message

One Liners: Data Communication and Networks

1. Data communication is the electronic exchange of data between two devices via a transmission medium.
2. The five fundamental components of a data communication system are Message, Sender, Receiver, Transmission Medium, and Protocol.
3. A message can consist of text, numbers, pictures, sound, video, or any combination thereof.
4. The sender, or transmitter, is the device that originates and sends the data message.
5. The transmitter converts the message into a signal suitable for transmission over the chosen medium.
6. The receiver, or destination, is the device that accepts the transmitted message.
7. The receiver converts the received signal back into a form usable by the destination.
8. The transmission medium is the physical path through which the message travels from sender to receiver.
9. A protocol is a set of rules governing data communication, representing an agreement between communicating devices.
10. Protocols handle aspects like error detection, synchronization, signaling, and authentication.
11. An encoder converts digital signals into a form suitable for transmission, while a decoder converts them back.
12. The three key properties of an effective data communication system are Delivery, Accuracy, and Timeliness.
13. Delivery ensures data reaches the correct intended destination.
14. Accuracy requires that data received is identical to data sent, without alteration.
15. Timeliness for real-time data means delivery as it is produced, without significant delay or jitter.
16. Signals are electromagnetic or light waves representing data used to transfer information.
17. An analog signal is a continuous electrical wave that varies smoothly over time.
18. The key characteristics of an analog signal are Amplitude, Frequency, and Phase.

Practice MCQs

1. Which of the following is NOT a fundamental component of a data communication system?
   a) Message
   b) Sender
   c) Router
   d) Protocol
   Answer: c) Router

2. In data communication, what is the primary function of a protocol?
   a) To amplify the signal strength
   b) To convert analog signals to digital
   c) To govern the rules and conventions for communication
   d) To provide the physical transmission path
   Answer: c) To govern the rules and conventions for communication

3. The property of a communication system that ensures data is delivered without alteration is called:
   a) Delivery
   b) Timeliness
   c) Accuracy
   d) Synchronization
   Answer: c) Accuracy

4. Which characteristic of an analog signal refers to the number of cycles it completes in one second?
   a) Amplitude
   b) Wavelength
   c) Frequency
   d) Phase
   Answer: c) Frequency

5. Unicode was developed primarily to address the limitation of ASCII in:
   a) Processing speed
   b) Representing characters from diverse world languages
   c) Error detection capabilities
   d) Signal transmission range
   Answer: b) Representing characters from diverse world languages

6. The phenomenon where a signal loses energy and weakens as it travels over a distance is known as:
   a) Distortion
   b) Noise
   c) Attenuation
   d) Crosstalk
   Answer: c) Attenuation

7. Which guided transmission medium operates on the principle of total internal reflection?
   a) Unshielded Twisted Pair (UTP)
   b) Coaxial Cable
   c) Shielded Twisted Pair (STP)
   d) Fiber Optic Cable
   Answer: d) Fiber Optic Cable

8. A major disadvantage of Satellite Microwave communication is:
   a) Inability to penetrate walls
   b) High signal propagation delay
   c) Very short range
   d) Susceptibility to electromagnetic interference
   Answer: b) High signal propagation delay

9. In which communication mode can both devices send and receive data, but not at the same time?
   a) Simplex
   b) Full-Duplex
   c) Half-Duplex

Chapter 12

Computational Thinking and Algorithms

Introduction to Computational Thinking

Computational Thinking (CT) is a structured, problem-solving methodology that enables individuals to tackle complex problems by applying techniques and processes inspired by computer science. It is a universal skill, not limited to programming, applicable in fields such as mathematics, science, engineering, business, healthcare, and everyday life tasks like planning a trip or organizing an event. CT involves a mental framework for logical and creative problem-solving, using specific techniques to think clearly, logically, and systematically.

The primary goal is to design systematic, step-by-step solutions that can be executed by a human, a computer, or both. It prepares individuals to deconstruct complex challenges, identify patterns, focus on essentials, and design effective solutions.

Core Components (Pillars) Of Computational Thinking

Computational thinking is built upon four fundamental, interconnected pillars.

Decomposition

Definition: The process of breaking a large, complex problem into smaller, more manageable sub-problems or tasks.
Purpose: Makes understanding, analyzing, and solving the problem significantly easier. It simplifies the overall task and allows for focused work on individual parts.
Examples:

- **Everyday:** Building a birdhouse can be decomposed into: designing, gathering materials, cutting wood, assembling, painting, and installing. Preparing a meal involves steps like deciding the menu, gathering ingredients, cooking, and serving.
- **Software:** Building a mobile app is decomposed into designing the user interface, coding features (login, navigation), and implementing data storage.
- **Robotics:** Solving a maze problem for a robot can be broken down into: determining the maze size, defining start/end points, identifying allowed moves, and recognizing dead ends.

Pattern Recognition

Definition: Identifying similarities, trends, or regularities within data or across different problems.

Example: Print Multiplication Table (using WHILE loop)

1. START
2. Declare integer A, counter.
3. Read A.
4. counter = 1.
5. WHILE counter <= 10
1. Print A * counter.
2. counter = counter + 1.
6. END WHILE
7. END

REPRESENTING ALGORITHMS: DESIGN METHODS

Flowcharts

A **pictorial/graphical representation** of an algorithm using standardized symbols connected by arrows (flowlines) to show the sequence of steps.

Common Flowchart Symbols:

Symbol	Name	Description
Oval	Terminal	Start or Stop point of the process.
Parallelogram	Input/Output	Used for reading input or displaying output.
Rectangle	Process	Represents a computation or action step.
Diamond	Decision	Branches the flow based on a Yes/No condition.
Arrow	Flowline	Shows the direction of flow between steps.

Practice MCQs

1. Which of the following is NOT one of the four core pillars of Computational Thinking?
   a) Decomposition
   b) Pattern Recognition
   c) Data Encryption
   d) Algorithmic Design
   Answer: c) Data Encryption

2. In the problem-solving process, the step that involves breaking down the problem into smaller parts to identify Facts, Input, Output, and Process is called:
   a) Identify the Problem
   b) Define the Problem
   c) Analyze the Problem
   d) Plan the Solution
   Answer: c) Analyze the Problem

3. The IPO Model in computational problem-solving stands for:
   a) Input, Program, Outcome
   b) Instruction, Process, Output
   c) Input, Process, Output
   d) Initialize, Process, Operate
   Answer: c) Input, Process, Output

4. A problem that asks, "Is this number a prime?" is best categorized as a:
   a) Search Problem
   b) Counting Problem
   c) Decision Problem
   d) Optimization Problem
   Answer: c) Decision Problem

5. If you have 5 different shirts and 4 different pairs of pants, and you want to find the total number of possible outfits (one shirt + one pant), you must apply the:
   a) Addition Principle
   b) Subtraction Principle
   c) Multiplication Principle
   d) Division Principle
   Answer: c) Multiplication Principle

6. The formula nCr = n! / (r!(n-r)!) is used to calculate:
   a) The number of permutations of *r* items from *n*
   b) The number of combinations of *r* items from *n*
   c) The number of ways to arrange *n* items in a line
   d) The sum of all possible selections
   Answer: b) The number of combinations of *r* items from *n*

7. The Pigeonhole Principle guarantees that if you have 15 students and only 12 lockers, then:
   a) Every locker will be used.
   b) At least one locker will be empty.
   c) At least one locker will contain more than one item.
   d) The number of lockers must be increased.
   Answer: c) At least one locker will contain more than one item.

8. Which characteristic of a good algorithm explicitly requires that it must stop after a finite number of steps?
   a) Definiteness
   b) Finiteness
   c) Feasibility
   d) Generality
   Answer: b) Finiteness

9. An algorithm that solves a problem by dividing it into independent sub-problems, solving each, and combining

Chapter 13

Programming Fundamentals

The Foundations of Computing & Programming

Introduction to Computing & Binary

Computers are universal machines that process information. At their most fundamental level, they operate on two states: ON and OFF, represented by the numbers **1** and **0**. This binary foundation underpins all digital computing.

Information Representation: The Binary System

Everything a computer processes—text, images, sound, and programs—is ultimately represented as numbers using the **binary number system**, which has a base of 2 and uses only two digits: **0** and **1**.

- **Bit:** The smallest unit of data, short for **Binary Digit**. A single bit holds a value of either 0 or 1.
- **Byte:** A group of 8 bits. It is the standard unit for measuring data size.
- **Larger Units:** Data storage scales up using binary multiples (based on 1024, which is 2^{10}):
  - 1 Kilobyte (KB) = 1024 Bytes
  - 1 Megabyte (MB) = 1024 KB
  - 1 Gigabyte (GB) = 1024 MB
  - 1 Terabyte (TB) = 1024 GB

Aspect	Front-End (Client-Side)	Back-End (Server-Side)
Focus	What the user sees and interacts with.	The server, databases, and application logic.
Goal	Create an attractive, user-friendly interface.	Ensure data is processed, stored, and delivered correctly.
Languages	HTML, CSS, JavaScript.	Python, PHP, Ruby, JavaScript (Node.js).
Interaction	Sends user requests to the back-end.	Processes requests, interacts with databases, sends content back.

Static vs. Dynamic Websites

- **Static:** Content unchanged unless manually edited. Simple and fast.
- **Dynamic:** Content changes based on user input or real-time data using scripting languages (JavaScript, PHP). More interactive and engaging.

Responsive Web Design

Websites that automatically adjust layout and functionality to fit different screen sizes (desktop, tablet, mobile) using fluid grids and flexible images.

Core Web Technologies: HTML & CSS

HyperText Markup Language (HTML)

The standard language for creating and structuring webpage content using **tags**.

Basic Structure:

```
html
```

One Liners: Programing Fundamentals

1. At its core, a computer processes information using two states: ON (1) and OFF (0).
2. The binary number system has a base of 2 and uses only the digits 0 and 1.
3. A Bit (Binary Digit) is the smallest unit of data, holding a value of either 0 or 1.
4. A Byte is a group of 8 bits and is the standard unit for measuring data size.
5. Data storage scales using binary multiples: 1 Kilobyte (KB) = 1024 Bytes.
6. In a binary number, the leftmost bit is the Most Significant Bit (MSB) and the rightmost is the Least Significant Bit (LSB).
7. To convert binary to decimal, use positional notation: multiply each bit by 2 raised to its position power and sum the results.
8. To convert decimal to binary, use the repeated division-by-2 method and read the remainders from the last to the first.
9. ASCII is an 8-bit code representing 128 characters, where 'a' = 01100001_2 (97_{10}).
10. Unicode is an extended system capable of representing over 65,000 characters from many world languages.
11. In the RGB color model, each color component (Red, Green, Blue) is represented by an 8-bit number (0-255).
12. White in RGB is represented as (255,255,255) or $(11111111, 11111111, 11111111)_2$.
13. Sound is converted from analogue to digital using an Analogue-to-Digital Converter (ADC).
14. The quality of digital sound is determined by Sample Rate (samples per second) and Bit Depth (bits per sample).
15. Problem analysis involves clearly defining the problem, identifying causes, and brainstorming solutions.
16. Solution planning techniques include Abstraction, Divide and Conquer, Analogy, Brainstorming, and Research.
17. The best solution is evaluated based on Speed/Time Efficiency, Cost (resources, memory), and Complexity (number of steps).
18. An algorithm is a well-defined, step-by-step procedure that takes input, processes it, and produces an output.
19. Algorithm efficiency is measured by Time Complexity (execution speed) and Space Complexity (memory usage).
20. A flowchart is a diagrammatic representation of an algorithm using standardized symbols.
21. In a flowchart, an Oval represents the Start or End terminal.
22. In a flowchart, a Parallelogram represents an Input or Output operation.
23. In a flowchart, a Rectangle represents a Process or calculation step.
24. In a flowchart, a Diamond represents a Decision point (Yes/No, True/False).
25. Before drawing a flowchart, determine the problem's inputs, processing, decisions, and outputs.
26. A Program is a set of ordered instructions telling a computer how to perform a specific task.
27. The concept of a stored program in memory was pioneered by John von Neumann.

Practice MCQs

1. Which of the following correctly defines the relationship between a bit and a byte?
   a) A bit is a group of 8 bytes.
   b) A byte is a group of 8 bits.
   c) A bit represents a decimal digit, while a byte represents a binary digit.
   d) A byte is always 1024 bits.
   Answer: b) A byte is a group of 8 bits.

2. In the binary number 1101, the weight of the digit '1' in the leftmost position (assuming positions start at 0 from the right) is:
   a) 2^0
   b) 2^1
   c) 2^2
   d) 2^3
   Answer: d) 2^3

3. Using the repeated division-by-2 method, the binary representation of the decimal number 29 is:
   a) 11100
   b) 11101
   c) 11011
   d) 10111
   Answer: b) 11101

4. In the RGB color model, the binary representation for the color Red (255, 0, 0) would be:
   a) (11111111, 00000000, 00000000)
   b) (00000000, 11111111, 00000000)
   c) (00000000, 00000000, 11111111)
   d) (11111111, 11111111, 11111111)
   Answer: a) (11111111, 00000000, 00000000)

5. When planning a software solution, the technique of creating a simplified model to focus on essential details is known as:
   a) Decomposition
   b) Pattern Recognition
   c) Abstraction
   d) Algorithmic Design
   Answer: c) Abstraction

6. The primary purpose of a flowchart's diamond-shaped symbol is to represent a:
   a) Start or End point
   b) Input or Output operation
   c) Calculation or Process step
   d) Decision or Conditional branch
   Answer: d) Decision or Conditional branch

7. The von Neumann architecture is most famous for introducing the concept of:
   a) Binary number system
   b) Stored-program computers
   c) Graphical user interfaces
   d) Object-oriented programming
   Answer: b) Stored-program computers

8. A program that translates assembly language mnemonics into machine code is called a(n):
   a) Compiler
   b) Interpreter
   c) Assembler
   d) Linker
   Answer: c) Assembler

9. In programming, a construct that allows a block of code to be executed repeatedly as long as a condition remains true is a:
   a) Sequence
   b) Selection
   c) Loop (Repetition)
   d) Event
   Answer: c) Loop (Repetition)

10. In Scratch, a variable declared as "for this sprite only" has what kind of scope?

Chapter 14

Data Base and Data Management (DBMS)

Data and Database Fundamentals

Data, Information, and Knowledge

Data consists of raw facts and figures, such as numbers, words, measurements, observations, images, or sounds (e.g., daily temperature readings, list of student names and marks). **Information** is processed, organized, or structured data presented in a meaningful context (e.g., a weather forecast, student percentage and grade). Information is derived from data and is useful for decision-making. **Knowledge** is the actionable insight gained from understanding patterns in information. Data becomes information through processing, and information becomes knowledge through analysis and interpretation.

Aspect	Data	Information
Nature	Raw, unprocessed facts	Processed, organized, meaningful data
Role in System	Input to a computer system	Output of data processing
Usefulness	May not be meaningful on its own	Useful, valuable, supports decisions
Reproducibility	Difficult to reproduce if lost	Easier to reproduce (e.g., recalculated)
Dependence	An independent entity	Depends on data

The Need for Databases: Evolution from File Systems

Before databases, **File Management Systems (FMS)** were used. Data was stored in independent files, each a collection of records made up of fields. This approach led to significant problems:

- **Data Redundancy:** The same data duplicated across multiple files.

One Liners: Data and Data Management (DBMS)

1. Data consists of raw, unprocessed facts and figures like numbers, words, measurements, observations, images, or sounds.
2. Information is processed, organized, or structured data presented in a meaningful context, useful for decision-making.
3. Knowledge is the actionable insight gained from understanding patterns in information.
4. Data becomes information through processing; information becomes knowledge through analysis and interpretation.
5. In a system, data is the input, and information is the output of data processing.
6. Data may not be meaningful on its own, whereas information is valuable and supports decisions.
7. Information is easier to reproduce (e.g., recalculated) compared to raw data.
8. Information depends on data, but data is an independent entity.
9. Before databases, File Management Systems (FMS) stored data in independent files.
10. Data Redundancy in FMS means the same data is duplicated across multiple files.
11. Data Inconsistency occurs when changes in one file are not updated in others, leading to conflicting information.
12. Data-Program Dependence means changes in data structure require changes to all related programs.
13. Data Isolation refers to data being scattered in various formats, making retrieval difficult.
14. Integrity Problems in FMS involve manually ensuring data accuracy (e.g., account balance > 0).
15. Atomicity Problems refer to the difficulty in ensuring transactions (like funds transfer) complete as a whole.
16. Poor Data Security in FMS results from no centralized security control, making files vulnerable.
17. Intensive coding and difficult data access in FMS required separate programs for each task.
18. A database is a shared, integrated, and logically related collection of data, along with its description (metadata).
19. A key principle of databases is that data is independent of the application programs that use it.
20. A Database Management System (DBMS) is software that enables users to create, maintain, manipulate, and access a database.
21. Manipulation in a DBMS includes adding, deleting, and changing data.
22. Popular DBMS examples include Microsoft Access, Oracle, MySQL, Microsoft SQL Server, and IBM DB2.
23. A DBMS provides controlled data redundancy, meaning data is stored logically only once.
24. Data Consistency is achieved in DBMS as minimal redundancy ensures uniform data.
25. Data Sharing in a DBMS means a centralized resource is accessible by authorized users.
26. Enforcement of Standards is possible in DBMS through centralized control of naming, format, and structure.
27. Enhanced Security in DBMS comes from centralized permissions and access controls.

Practice MCQs

1. What is the primary difference between data and information?
A) Data is processed; information is raw
B) Data is meaningful on its own; information requires context
C) Data is raw facts; information is processed data in context
D) Data is output; information is input
Answer: C) Data is raw facts; information is processed data in context

2. Which of the following was a major problem with File Management Systems (FMS)?
A) Program-Data Independence
B) Controlled Data Redundancy
C) Data Inconsistency
D) Enhanced Security
Answer: C) Data Inconsistency

3. What is the key principle that data in a database is independent of the application programs called?
A) Data Redundancy
B) Program-Data Dependence
C) Data Isolation
D) Program-Data Independence
Answer: D) Program-Data Independence

4. Which database model allows a child record to have more than one parent?
A) Hierarchical Model
B) Network Model
C) Relational Model
D) Object-Oriented Model
Answer: B) Network Model

5. In the relational model, what is a two-dimensional structure of rows and columns called?
A) Attribute
B) Tuple
C) Relation/Table
D) Key
Answer: C) Relation/Table

6. Which property of a relation states that each row must be unique?
A) Column Atomicity
B) Order Insignificance
C) No Duplicate Rows
D) NULL Allowed
Answer: C) No Duplicate Rows

7. What is a set of one or more attributes that can uniquely identify all other attributes in a relation called?
A) Candidate Key
B) Super Key
C) Primary Key
D) Foreign Key
Answer: B) Super Key

8. Which key must be unique and cannot contain NULL values?
A) Foreign Key
B) Alternate Key
C) Secondary Key
D) Primary Key
Answer: D) Primary Key

9. What does a Foreign Key (FK) enforce between tables?
A) Entity Integrity
B) Referential Integrity
C) Column Atomicity
D) Data Redundancy
Answer: B) Referential Integrity

10. In an ER diagram, what does a diamond represent?

Chapter 15

System Development, Troubleshooting and Maintenance

Introduction

Systems are created to solve problems. Modern systems are often large and complex, requiring collaboration between teams of architects, analysts, programmers, testers, and users to produce the software that drives organizations. To manage this complexity and ensure structured, high-quality outcomes, a systematic process is essential. This process is known as the System Development Life Cycle (SDLC). This unit focuses on the SDLC, explaining its importance, objectives, key participants (stakeholders), and the logical phases followed to develop a software product from conception to maintenance.

What is a System?

The term "system" originates from the Greek word "*systema*," meaning to "place together." A system can be defined as a set of interrelated components with a clearly defined boundary that work together to achieve a common set of objectives. When these components are methods, procedures, and routines applied in a proper sequence to build software, it is called a software system.

System Development Life Cycle (SDLC) and Its Importance

The **System Development Life Cycle (SDLC)** is a conceptual model and a structured, stepwise process used in project management to guide the development of an information system. It encompasses all stages from an initial feasibility study through to the maintenance of the completed application. It is also known as information system development or application development.

One Liners: System Development Troubleshooting and Maintenance

1. System troubleshooting is a systematic process to identify problems and find quick solutions to prevent costly downtime and system damage.
2. The primary goal of troubleshooting is to maintain system reliability, security, and efficiency without always relying on professional help.
3. The first step in the systematic troubleshooting process is to identify and clearly define what is not working as expected.
4. After identifying the problem, the troubleshooter must establish a theory of probable cause based on the observed symptoms.
5. Testing the theory to determine the cause involves performing specific checks to confirm or rule out the suspected issue.
6. Once the cause is confirmed, the next step is to establish a detailed plan of action to resolve the problem.
7. The implementation phase involves carrying out the planned actions to fix the identified issue.
8. After implementing the solution, it is critical to verify full system functionality to ensure the problem is resolved.
9. Documenting findings, actions, and outcomes creates a valuable knowledge base for future reference.
10. Troubleshooting is crucial for preventing downtime, which can lead to lost productivity and revenue for businesses.
11. Ensuring data integrity is a key reason for troubleshooting, as it helps identify and fix problems that could corrupt information.
12. Effective troubleshooting can reveal security vulnerabilities and breaches, allowing for swift protective action.
13. Troubleshooting enhances system performance by identifying causes of slowdowns, such as insufficient RAM or software conflicts.
14. Regular troubleshooting and fixing small issues early can extend equipment life by preventing major failures.
15. Mastering troubleshooting saves costs by reducing the need for expensive emergency repairs and prolonged downtime.
16. A reliable, well-performing system resulting from good troubleshooting enhances the overall user experience.
17. For an application freezing, a common solution is to use Task Manager (Ctrl+Alt+Delete) to end the unresponsive task.
18. If an application freezing persists, reinstalling the application or checking for updates is recommended.
19. For unresponsive peripherals, the first steps are to check physical connections and unplug/replug the device.

Practice MCQs

1. **What is the primary goal of system troubleshooting?**
a) To increase software licensing costs
b) To maintain system reliability, security, and efficiency
c) To replace all hardware components periodically
d) To reduce the need for user training
Answer: b) To maintain system reliability, security, and efficiency

2. **Which of the following is the FIRST step in the systematic troubleshooting process?**
a) Test the theory
b) Establish a plan of action
c) Identify the problem
d) Document findings
Answer: c) Identify the problem

3. **A laptop does not turn on. According to troubleshooting steps, what should you do immediately after identifying this problem?**
a) Replace the motherboard
b) Establish a theory of probable cause (e.g., dead battery)
c) Immediately document the failure
d) Reinstall the operating system
Answer: b) Establish a theory of probable cause (e.g., dead battery)

4. **Why is documenting the troubleshooting process considered important?**
a) It increases the complexity of the solution
b) It creates a bill for the client
c) It creates a valuable knowledge base for future reference
d) It is only required for auditing purposes
Answer: c) It creates a valuable knowledge base for future reference

5. **Which troubleshooting benefit directly relates to minimizing financial loss for a business?**
a) Extending equipment life
b) Preventing downtime
c) Enhancing user experience
d) Improving security
Answer: b) Preventing downtime

6. **An application becomes unresponsive. What is the most common immediate software-based solution?**
a) Reformat the hard drive
b) Use Task Manager to end the task
c) Restart the web server
d) Update the BIOS
Answer: b) Use Task Manager to end the task

7. **For an unresponsive external mouse, which sequence of actions is most appropriate initially?**
a) Update the OS, then replace the mouse
b) Check physical connections, then unplug and replug
c) Reinstall all device drivers, then restart
d) Scan for viruses, then check the power supply
Answer: b) Check physical connections, then unplug and replug

8. **What is the primary technical reason restarting a computer often resolves software issues?**
a) It upgrades the hardware firmware
b) It clears memory and stops conflicting processes

Chapter 16

Emerging and Contemporary Technologies

Introduction to Emerging Technologies

Definition and Characteristics

An Emerging Technology is a new technology or a significant advancement in an existing one, capable of bringing about profound technical, institutional, and social changes. These technologies are poised to replace current systems in the near future and will be integrated into every field, from education and IT to medicine, transportation, and communication. They are distinguished by key characteristics:

- **Innovation:** Introduces novel ideas and methods.
- **Fast Growth:** Develops and scales rapidly.
- **Consistency:** Provides reliable and repeatable performance.
- **Prominent Impact:** Creates significant changes in how tasks are performed and problems are solved.
- **Interdisciplinary Nature:** Combines knowledge and methods from multiple fields like computer science, engineering, and biology.
- **Convergence:** Merges different technologies to create new, synergistic capabilities.

Detailed Exploration of Emerging Technologies

Artificial Intelligence (AI) and Machine Learning (ML)

Artificial Intelligence (AI) is a broad field of computer science focused on building intelligent machines and software capable of performing tasks that typically require human-like intelligence, such as reasoning, learning, problem-solving, and decision-making. The term was coined by John McCarthy in 1956. Key subfields include:

- **Machine Learning (ML):** A subset of AI that gives computers the ability to learn from data and experience without being explicitly programmed. ML algorithms build models by identifying patterns in large datasets.
  - **Supervised Learning:** The algorithm learns from a labeled dataset where the correct output is known, used for making predictions on new data (e.g., predicting prices).
  - **Unsupervised Learning:** The algorithm finds hidden patterns or intrinsic structures in unlabeled data, often through clustering (e.g., grouping customers).

One Liners: Emerging and Contemporary Technologies

1. An Emerging Technology is a new technology or a significant advancement in an existing one, capable of bringing profound technical, institutional, and social changes.
2. Emerging technologies are poised to replace current systems in the near future and will be integrated into every field.
3. Key characteristics of emerging technologies include Innovation, Fast Growth, Consistency, Prominent Impact, Interdisciplinary Nature, and Convergence.
4. The Interdisciplinary Nature of emerging technologies combines knowledge from fields like computer science, engineering, and biology.
5. Convergence refers to the merging of different technologies to create new, synergistic capabilities.
6. Artificial Intelligence (AI) is a broad field of computer science focused on building intelligent machines capable of human-like tasks such as reasoning, learning, and decision-making.
7. The term "Artificial Intelligence" was coined by John McCarthy in 1956.
8. Machine Learning (ML) is a subset of AI that gives computers the ability to learn from data and experience without being explicitly programmed.
9. Supervised Learning involves algorithms learning from labeled datasets where the correct output is known, used for making predictions.
10. Unsupervised Learning involves algorithms finding hidden patterns in unlabeled data, often through clustering.
11. Deep Learning (DL) is a specialized subset of ML that uses Neural Networks with many hidden layers.
12. A Neural Network is inspired by the human brain and consists of interconnected nodes (neurons).
13. The layers of a Neural Network are Input Layer, Hidden Layers, and Output Layer.
14. Weights in a neural network represent the importance of connections between neurons.
15. Biases are threshold adjusters in neural networks that help the model fit the data better.
16. Activation Functions in neural networks determine whether a neuron should be activated.
17. Loss Functions measure the difference between the predicted output and the actual target.
18. Training a neural network involves Feedforward Propagation and Backpropagation to minimize error.
19. Deep Learning excels at autonomously extracting complex patterns from vast amounts of unstructured data like images and text.
20. The hierarchical relationship is: AI ⊃ ML ⊃ Neural Networks ⊃ Deep Learning.
21. Natural Language Processing (NLP) enables computers to understand, interpret, and generate human language.
22. NLP applications include language translation, spam filtering, sentiment analysis, chatbots, and voice assistants.
23. Speech Recognition converts spoken words into text or commands (e.g., dictation software, Siri).

Practice MCQs

1. Which of the following is NOT a characteristic of an emerging technology?
A) Innovation
B) Slow and steady growth
C) Interdisciplinary nature
D) Prominent impact
Answer: B) Slow and steady growth

2. Who coined the term "Artificial Intelligence"?
A) Alan Turing
B) John McCarthy
C) Marvin Minsky
D) Claude Shannon
Answer: B) John McCarthy

3. Which subset of AI gives computers the ability to learn from data without explicit programming?
A) Natural Language Processing
B) Machine Learning
C) Computer Vision
D) Expert Systems
Answer: B) Machine Learning

4. In machine learning, which type involves algorithms learning from labeled datasets?
A) Unsupervised Learning
B) Reinforcement Learning
C) Supervised Learning
D) Deep Learning
Answer: C) Supervised Learning

5. What is the hierarchical relationship between AI, ML, Neural Networks, and Deep Learning?
A) AI ⊃ Neural Networks ⊃ ML ⊃ Deep Learning
B) AI ⊃ ML ⊃ Neural Networks ⊃ Deep Learning
C) ML ⊃ AI ⊃ Deep Learning ⊃ Neural Networks
D) Deep Learning ⊃ Neural Networks ⊃ ML ⊃ AI
Answer: B) AI ⊃ ML ⊃ Neural Networks ⊃ Deep Learning

6. Which AI subfield enables computers to understand, interpret, and generate human language?
A) Computer Vision
B) Robotics
C) Natural Language Processing
D) Speech Recognition
Answer: C) Natural Language Processing

7. What is the key difference between speech recognition and voice recognition?
A) Speech recognition identifies a person; voice recognition converts speech to text.
B) Speech recognition converts speech to text; voice recognition identifies a person.
C) Both are the same.
D) Speech recognition is for commands; voice recognition is for transcription.
Answer: B) Speech recognition converts speech to text; voice recognition identifies a person.

8. Which technology creates a fully immersive, artificial three-dimensional environment?
A) Augmented Reality
B) Virtual Reality
C) Holographic Imaging
D) 3D Printing
Answer: B) Virtual Reality

Chapter 17

Digital Citizenship, Literacy and Ethics

Introduction: Navigating the Modern Digital World

The digital landscape is the cornerstone of modern society, transforming how we communicate, learn, work, and access entertainment. This evolution from traditional methods to a connected, technology-driven world brings immense power and convenience, but also introduces significant responsibilities, risks, and ethical dilemmas. This Master Chapter provides a complete, unified, and self-contained guide to becoming a competent, safe, responsible, and ethical participant in the digital world. It integrates foundational skills, security practices, ethical frameworks, societal impacts, and entrepreneurial thinking into a seamless professional textbook.

The Digital Foundation – Hardware, Software, and Systems

Understanding Software

A computer consists of **hardware**—the physical components—and **software**, the set of instructions, data, and programs that operate the computer to perform specific tasks.

Types of Software

1. **System Software:** The essential set of programs that acts as the primary interface between hardware and the user. Its purpose is to simplify hardware use, control operations, and optimize performance.
   - **Examples:** Operating Systems (OS), Device Drivers, Utility Programs, Language Translators.
2. **Application Software:** Programs written to carry out specific tasks for the user.
   - **Examples:** Word Processors (Microsoft Word), Spreadsheets (Excel), Presentation Software (PowerPoint), Web Browsers (Chrome), Email Clients (Gmail), Image Editors (Paint).

System Software Deep Dive

The Operating System (OS)

The OS is the most critical system software that controls and manages all computer operations. A computer cannot function without it.

- **Cyberterrorism, Cyberstalking, Phishing, Spoofing.**

Malicious Software (Malware)

Software designed to harm, disrupt, or gain unauthorized access.

Type	Description	Key Characteristics
Virus	Attaches to a legitimate file/program and replicates when executed.	Requires user action, spreads via files, corrupts/deletes data.
Worm	A standalone program that self-replicates across networks.	Does not need a host file, consumes bandwidth/space.
Trojan Horse	Disguises as legitimate software but performs malicious actions.	Does not self-replicate; creates backdoors, steals data.
Spyware	Secretly collects user information (habits, passwords).	Tracks activity, changes settings, leads to identity theft.
Adware	Displays unwanted ads, often bundled with free software.	Slows system, tracks browsing for targeted ads.
Ransomware	Encrypts victim's files, demanding payment for decryption.	Makes data inaccessible, extorts money.
Keylogger	Records keystrokes to capture sensitive data like passwords.	A type of spyware focused on logging input.

How Malware Spreads: Infected removable media, pirated software, network/internet downloads, email attachments (most common).

Symptoms of Infection: Slow performance, frequent crashes/freezes, unwanted pop-ups/toolbars, programs opening/closing automatically, inaccessible files, unusual error messages, emails sent from your account without knowledge.

One Liners: Digital Citizenship, Ethics and Literacy

1. The digital landscape is the cornerstone of modern society, transforming communication, learning, work, and entertainment.
2. A computer consists of hardware (physical components) and software (instructions, data, and programs).
3. System software acts as the primary interface between hardware and the user, simplifying hardware use, controlling operations, and optimizing performance.
4. Application software carries out specific tasks for the user (e.g., word processors, spreadsheets).
5. The Operating System (OS) is the most critical system software that controls and manages all computer operations; a computer cannot function without it.
6. OS functions include Booting, Security Management, Application Management, Memory Management, File Management, Device Management, and providing a User Interface.
7. Common OS examples are Microsoft Windows, macOS, Linux, Android, and iOS.
8. Device Drivers are specialized programs enabling hardware components to communicate with the OS.
9. Utility Programs perform management and maintenance tasks (e.g., antivirus, disk cleanup).
10. Language Translators convert human-readable programming code into machine-understandable code (Assemblers, Compilers, Interpreters).
11. The desktop is the main screen after startup, containing icons, taskbar, Start button/menu, notification area, and background/wallpaper.
12. A File is a common storage unit holding information; a Folder is a virtual container used to organize files.
13. A Shortcut is a link providing quick access to a file, folder, or program without moving the original item.
14. Essential file operations include Create, Rename, Cut/Copy/Paste, Delete & Restore, and Drag and Drop.
15. Deleted files are sent to the Recycle Bin, from which they can be restored.
16. A word processor is an application used to create, edit, format, save, and print text-based documents.
17. Key word processor interface elements include the Quick Access Toolbar, Title Bar, Ribbon, and Document Workspace.
18. Character formatting in a word processor includes changing Font Style, Size, Color, and applying Bold, Italic, Underline, and Text Alignment.
19. Page Layout adjustments involve margins, orientation (Portrait/Landscape), and size.
20. Lists can be bulleted (unordered) or numbered (sequential).
21. Headers and Footers are areas at the top and bottom of every page for titles, page numbers, and dates.
22. Spell & Grammar Check (F7) and Thesaurus are tools for error checking and finding synonyms.

Practice MCQs

1. What are the two main components of a computer system?
A) CPU and RAM
B) Hardware and Software
C) Input and Output
D) Operating System and Applications
Answer: B) Hardware and Software

2. Which type of software acts as the primary interface between hardware and the user?
A) Application Software
B) System Software
C) Utility Software
D) Programming Software
Answer: B) System Software

3. Which of the following is NOT a function of an Operating System?
A) Booting
B) Memory Management
C) Word Processing
D) File Management
Answer: C) Word Processing

4. What is the purpose of a Device Driver?
A) To perform disk cleanup
B) To enable hardware components to communicate with the OS
C) To compile programming code
D) To create documents
Answer: B) To enable hardware components to communicate with the OS

5. Where are deleted files typically stored before permanent deletion?
A) Downloads folder
B) Recycle Bin
C) Temp folder
D) Desktop
Answer: B) Recycle Bin

6. Which keyboard shortcut is used to copy selected text or files?
A) Ctrl+X
B) Ctrl+C
C) Ctrl+V
D) Ctrl+A
Answer: B) Ctrl+C

7. In a word processor, which tab is used to adjust page margins and orientation?
A) Home
B) Insert
C) Layout
D) Review
Answer: C) Layout

8. What does Bcc stand for in an email?
A) Basic Carbon Copy
B) Blind Carbon Copy
C) Broad Copy Control
D) Binary Copy Code
Answer: B) Blind Carbon Copy

9. Which email protocol downloads emails from the server to a single device and typically removes them from the server?
A) SMTP
B) IMAP
C) POP
D) HTTP
Answer: C) POP

10. What is the ability to effectively find, create, evaluate, communicate, and share content in a digital

Chapter 18

Entrepreneurship in the Digital Age

Introduction

Entrepreneurship is the dynamic process of identifying a market opportunity, conceptualizing a solution, and undertaking the risk of launching and managing a new business venture to bring new products, services, or processes to life. It is the engine of innovation, job creation, and economic growth. In the contemporary world, this traditional process has been fundamentally transformed by digital technologies. The fusion of classic business acumen with tools like the internet, social media, cloud computing, and data analytics has created unprecedented opportunities while reshaping the entrepreneurial landscape. This Master Chapter provides a comprehensive, unified guide to understanding the complete journey of entrepreneurship—from its core principles and initial idea validation to building, launching, and scaling a venture in the digital era. It is designed to be a self-contained, professional resource for students and aspiring entrepreneurs.

The Foundation of Entrepreneurship

Definition and Core Concepts

- **Entrepreneur:** An individual who organizes, manages, and assumes the financial risks of a new business venture. An entrepreneur is commonly seen as an **innovator**, a source of new ideas, goods, services, and business procedures. The term originates from the French word meaning "to undertake."
- **Entrepreneurship:** The process of designing, launching, and running this new business venture. It involves identifying a market need, taking calculated risks under conditions of uncertainty, and making strategic decisions to achieve business objectives and create value.

Significance and Impact

Entrepreneurship is a vital catalyst for any economy due to its multi-faceted role:

- **Economic Growth:** Creates new jobs and introduces new products and services, stimulating economic activity.
- **Innovation and Progress:** Drives groundbreaking ideas that transform lifestyles and industries (e.g., smartphones, digital platforms).
- **Job Creation:** Generates employment opportunities directly and indirectly.

One Liners: Entrepreneurship in Digital Age

1. Entrepreneurship is the dynamic process of identifying a market opportunity and undertaking the risk of launching a new business venture.
2. An entrepreneur is an individual who organizes, manages, and assumes the financial risks of a new business venture.
3. The term "entrepreneur" originates from the French word meaning "to undertake."
4. Entrepreneurship is commonly seen as a source of innovation, introducing new ideas, goods, services, and business procedures.
5. The process of entrepreneurship involves identifying a market need, taking calculated risks, and making strategic decisions to create value.
6. Entrepreneurship acts as a vital catalyst for economic growth by creating new jobs.
7. It drives economic growth by introducing new products and services that stimulate economic activity.
8. Entrepreneurship is a primary driver of groundbreaking innovation that transforms lifestyles and industries.
9. A major impact of entrepreneurship is job creation, generating employment opportunities both directly and indirectly.
10. By introducing fresh ideas and competition, entrepreneurship leads to better products, services, and prices for consumers.
11. Social entrepreneurship specifically addresses pressing societal and environmental challenges.
12. A key characteristic of successful entrepreneurs is innovation and creativity.
13. Entrepreneurs exhibit calculated risk-taking, understanding that failure is possible but great rewards can follow.
14. Successful entrepreneurs are moderate risk-takers, not gamblers.
15. Persistence and resilience are essential attributes for overcoming inevitable challenges and setbacks.

Practice MCQs

1. **What is the core definition of an entrepreneur?**
   a) An employee who follows company procedures
   b) An individual who organizes, manages, and assumes the financial risks of a new business venture
   c) A government official who regulates markets
   d) A consumer who buys innovative products
   Answer: b) An individual who organizes, manages, and assumes the financial risks of a new business venture

2. **The term "entrepreneur" originates from which language?**
   a) Latin
   b) Greek
   c) French
   d) German
   Answer: c) French

3. **Which of the following is NOT a primary impact of entrepreneurship on an economy?**
   a) Job Creation
   b) Economic Stagnation
   c) Innovation and Progress
   d) Increased Competition
   Answer: b) Economic Stagnation

4. **A successful entrepreneur who takes financial risks with an understanding of potential failure, but not recklessly, is best described as a:**
   a) Gambler
   b) Calculated risk-taker
   c) Avoider of all risk
   d) Follower of trends
   Answer: b) Calculated risk-taker

5. **Which characteristic involves the ability to pivot strategies based on market feedback?**
   a) Persistence
   b) Confidence
   c) Flexibility and Adaptability
   d) Future Orientation
   Answer: c) Flexibility and Adaptability

6. **What is a significant drawback of entrepreneurship?**
   a) Unlimited profit potential
   b) Gaining control over one's career
   c) Uncertainty and variability of income
   d) Doing personally enjoyable work
   Answer: c) Uncertainty and variability of income

7. **A local grocery store that supports a family lifestyle without seeking venture capital is an example of:**
   a) Scalable Startup
   b) Social Entrepreneurship
   c) Small Business Entrepreneurship
   d) Buyer Entrepreneurship
   Answer: c) Small Business Entrepreneurship

8. **Which type of entrepreneurship aims primarily for social good rather than profit maximization?**
   a) Innovative Entrepreneurship
   b) Social Entrepreneurship
   c) Hustler Entrepreneurship
   d) Imitator Entrepreneurship
   Answer: b) Social Entrepreneurship

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Chapter 19

Miscellaneous Information: Quick Revision Notes

1. Most Common Keyboard Shortcuts

Windows

- Ctrl + C → Copy selected item → Used to copy text/files.
- Ctrl + X → Cut selected item → Removes and copies text/files.
- Ctrl + V → Paste copied/cut item → Inserts clipboard content.
- Ctrl + Z → Undo last action → Reverses previous operation.
- Ctrl + Y / Ctrl + Shift + Z → Redo action → Reapplies undone action.
- Ctrl + A → Select all items → Highlights all content in a window.
- Ctrl + S → Save current document → Saves file in active application.
- Ctrl + F → Open find/search box → Searches for text on a page.
- Ctrl + P → Print current page/document → Opens print dialog.
- Ctrl + N → Open new window/document → Creates new instance.
- Ctrl + W → Close current window/tab → Shuts active tab/window.
- Ctrl + T → Open new browser tab → Creates tab in browsers.
- Ctrl + Shift + T → Reopen closed tab → Restores recently closed tab.
- Alt + Tab → Switch between open apps → Toggles running applications.
- Alt + F4 → Close active application → Quits current program.
- Windows Key + D → Show/hide desktop → Minimizes all windows.
- Windows Key + E → Open File Explorer → Launches file manager.
- Windows Key + L → Lock computer → Locks screen quickly.
- Windows Key + R → Open Run dialog → Executes commands.

- **Founder:** Marcos Galperin
- **Country of Origin:** Argentina
- **Headquarters:** Buenos Aires, Argentina
- **Current CEO:** Marcos Galperin
- **Major Services:** Online marketplace, payments (Mercado Pago), shipping, advertising.
- **Launch Year:** 1999
- **Key Fact:** Dominant e-commerce and fintech platform in Latin America.

- **JD.com (Jingdong)**
  - **Founder:** Liu Qiangdong (Richard Liu)
  - **Country of Origin:** China
  - **Headquarters:** Beijing, China
  - **Current CEO:** Xu Ran
  - **Major Services:** Online direct sales marketplace, logistics, technology services.
  - **Launch Year:** 1998
  - **Key Fact:** China's largest retailer by revenue, known for its in-house logistics network.
- **Etsy**
  - **Founder:** Rob Kalin, Chris Maguire, Haim Schoppik
  - **Country of Origin:** USA
  - **Headquarters:** Brooklyn, New York, USA
  - **Current CEO:** Josh Silverman
  - **Major Services:** Marketplace for handmade goods, vintage items, and craft supplies.
  - **Launch Year:** 2005
  - **Key Fact:** Leading global marketplace for unique and creative goods.
- **Zalando**

- **Networking:** Practice of connecting computers to share resources and information.
- **IP Address:** Numerical label assigned to each device on a network using IP.
- **MAC Address:** Unique hardware identifier assigned to a network interface controller.
- **Protocol:** Set of rules governing data communication between devices.
- **Router:** Networking device that forwards data packets between computer networks.
- **Switch:** Device that connects devices on a LAN and uses MAC addresses to forward data.
- **Firewall:** Security system that monitors and controls network traffic based on rules.
- **Cloud Computing:** Delivery of computing services over the internet ("the cloud").
- **IaaS:** Infrastructure as a Service – provides virtualized computing resources.
- **PaaS:** Platform as a Service – provides platform for developing and deploying apps.
- **SaaS:** Software as a Service – delivers software applications over the internet.
- **Virtualization:** Creating a virtual version of something (server, OS, storage, network).
- **Hypervisor:** Software that creates and runs virtual machines.
- **Artificial Intelligence (AI):** Simulation of human intelligence in machines.
- **Machine Learning (ML):** Subset of AI where machines learn from data without explicit programming.
- **Deep Learning (DL):** Subset of ML using neural networks with many layers.
- **Neural Network:** Computing system inspired by biological neural networks.
- **Supervised Learning:** ML training using labeled data.
- **Unsupervised Learning:** ML training using unlabeled data to find patterns.
- **Reinforcement Learning:** ML where an agent learns by receiving rewards/punishments.
- **Algorithm:** Step-by-step procedure for solving a problem or performing a computation.
- **Data Structure:** Particular way of organizing data for efficient access and modification.
- **Array:** Collection of items stored at contiguous memory locations.

- **PHP** was created by Rasmus Lerdorf in 1994.
- **SQL** was initially developed by IBM researchers Donald Chamberlin and Raymond Boyce.
- **Swift** programming language was created by Apple for iOS development (2014).
- **Kotlin** is a statically typed language for modern multi-platform apps, developed by JetBrains.
- **WhatsApp** was founded by Jan Koum and Brian Acton, acquired by Facebook in 2014.
- **Instagram** was founded by Kevin Systrom and Mike Krieger, acquired by Facebook in 2012.
- **TikTok** is owned by ByteDance, a Chinese company founded by Zhang Yiming.
- **Zoom** was founded by Eric Yuan, launched in 2013.
- **AWS (Amazon Web Services)** is the leading cloud service provider by market share.
- **Microsoft Azure** is Microsoft's cloud computing platform.
- **Google Cloud Platform (GCP)** is Google's suite of cloud computing services.
- **IBM Cloud** is IBM's cloud computing platform.
- **Oracle Cloud** is Oracle's cloud service offering.
- **Router** directs data packets between different networks (Internet to home network).
- **Switch** connects devices within a single network, using MAC addresses.
- **Modem** modulates and demodulates signals for transmission over telephone/cable lines.
- **Ethernet** is a family of wired networking technologies for LANs, standardized as IEEE 802.3.
- **Wi-Fi** is a family of wireless networking protocols based on IEEE 802.11 standards.
- **Bluetooth** is a short-range wireless technology standard (IEEE 802.15.1).
- **Firewall** monitors and filters incoming/outgoing network traffic based on security rules.
- **Antivirus** software is designed to detect, prevent, and remove malware.
- **VPN** creates a secure, encrypted connection over a less secure network (like the internet).

- **Launch Year of iPhone:** 2007.
- **Launch Year of Android OS:** 2008 (commercial release).
- **Launch Year of Facebook:** 2004.
- **Launch Year of YouTube:** 2005.
- **Launch Year of Bitcoin:** 2009.
- **Key Product of Adobe:** Photoshop, Creative Cloud.
- **Key Product of Salesforce:** CRM software.
- **Key Product of Oracle:** Oracle Database.
- **Key Product of SAP:** ERP software.
- **Key Product of Cisco:** Networking hardware.
- **Country of Origin for Nokia:** Finland.
- **Country of Origin for Sony:** Japan.
- **Country of Origin for Huawei:** China.
- **Country of Origin for Ericsson:** Sweden.
- **Country of Origin for Infosys:** India.
- **First Computer Virus:** The Creeper virus (1971).
- **First Graphical Web Browser:** Mosaic (1993).
- **First Search Engine:** Archie (1990).
- **First Social Media Site:** Six Degrees (1997).
- **First Programmer:** Ada Lovelace (wrote algorithm for Babbage's Analytical Engine).
- **Father of Computer Science:** Alan Turing.
- **Father of the Internet:** Vint Cerf and Bob Kahn (TCP/IP protocol).
- **Number of Bits in a Byte:** 8 bits.
- **Port Number for HTTP:** 80.

- **CMS:** Content Management System - Software application for creating and managing digital content.
- **ERP:** Enterprise Resource Planning - Integrated management of main business processes.
- **CRM:** Customer Relationship Management - System for managing company interactions with customers.
- **SCM:** Supply Chain Management - Management of flow of goods and services.
- **BI:** Business Intelligence - Technologies/applications for analyzing business information.
- **ETL:** Extract, Transform, Load - Process in data warehousing for preparing data for analysis.
- **OLAP:** Online Analytical Processing - Approach to answer multi-dimensional analytical queries.
- **OLTP:** Online Transaction Processing - Class of systems facilitating transaction-oriented applications.
- **NoSQL:** Not only SQL - Broad class of database management systems differing from relational databases.
- **MongoDB:** A popular document-oriented NoSQL database.
- **Hadoop:** Open-source framework for distributed storage/processing of big data.
- **Spark:** Apache Spark - Unified analytics engine for large-scale data processing.
- **Kafka:** Apache Kafka - Distributed event streaming platform.
- **DevOps:** Development and Operations - Culture/practice combining software development and IT operations.
- **CI/CD:** Continuous Integration/Continuous Deployment - Automating software delivery pipeline.
- **Agile:** Iterative approach to project management and software development.
- **Scrum:** Framework within which people can address complex adaptive problems in Agile.
- **Kanban:** Visual system for managing work as it moves through a process in Agile.
- **JVM:** Java Virtual Machine - Virtual machine enabling computer to run Java programs.

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Past Papers Questions

1. How many rows in MS Excel Sheet?
A) 86340
B) 1048576
C) 86400
D) None of these
Answer: B) 1048576

2. Which Pane is not available in PowerPoint?
A) WordArt
B) Insert
C) Animation
D) None of these
Answer: A) WordArt

3. Deleted Items in file directly go to the:
A) Recycle Bin
B) Desktop
C) Windows Folder
D) None of these
Answer: A) Recycle Bin

4. Crop function is used to crop:
A) Videos
B) Images
C) Files
D) None of these
Answer: B) Images

5. Which key is used to move the cursor to end of the line?
A) End
B) Home
C) Shift+ tab
D) None of these
Answer: A) End

6. In MS-DOS, DOS stands for:
A) Disk Operating System
B) Device Operating System
C) Driver Operating System
D) None of these
Answer: A) Disk Operating System

7. HTML stands for hypertext markup language is used for creating:
A) Web pages
B) Web server
C) Client server
D) None of these
Answer: A) Web pages

8. Gmail, Hotmail and Yahoo are:
A) Email Server
B) Client Server
C) Email Programmer
D) None of these
Answer: D) None of these

9. Windows 9 and Windows 10 are known as:
A) Operating system
B) System software
C) Application software
D) None of these
Answer: A) Operating system

10. In PowerPoint the header and footer button can be found on the:
A) Home tab
B) Insert tab
C) Draw tab
D) None of these
Answer: B) Insert tab

11. Which of the following are word processing software?
A) Browser
B) PowerPoint
C) MS Word
D) None of these
Answer: C) MS Word

126. Bar code reader is an _____ device.
A) Input
B) Output
C) Display
D) None of these
Answer: A) Input

127. Which is used in security system and criminal investigation?
A) Computer
B) Processor
C) Fingerprint reader
D) None of these
Answer: C) Fingerprint reader

128. Which is also known as mechanical agent?
A) Computer
B) Robots
C) Processor
D) None of these
Answer: B) Robots

129. _____ is the set of instructions given to the computer to perform a specific task.
A) Monitor
B) Software
C) Hardware
D) None of these
Answer: B) Software

130. Flat panels are usually used in:
A) Supercomputer
B) Personal computer
C) Laptops
D) None of these
Answer: C) Laptops

131. Cray T90 is an example of:
A) IBM
B) Hybrid computer
C) Super computer
D) None of these
Answer: C) Super computer

132. Which one is application software?
A) Windows
B) Linux
C) MS Excel
D) None of these
Answer: C) MS Excel

133. The language used for artificial intelligence is:
A) Cobol
B) Lisp
C) Fortran
D) None of these
Answer: B) Lisp

134. Which of the following is not a type of bus in the computer?
A) Data bus
B) Control bus
C) Power bus
D) None of these
Answer: C) Power bus

135. Decimal value of 2^-1 is equal to:
A) 0.5
B) 0.05
C) 0.35
D) None of these
Answer: A) 0.5

136. In a _____ topology, computer is directly linked to a center computer.
A) Bus
B) Star
C) Node
D) None of these
Answer: B) Star

137. MAN stands for:
A) Metropolitan Area Network
B) Metro Area Network
C) Metropolitan Area Network

274. The full form of CSS is:
A) Cascading Style Sheets
B) Cascading Style Sheets
C) Cascading Style Sheets
D) None of these
Answer: A) Cascading Style Sheets

275. The full form of JS is:
A) JavaScript
B) JavaScript
C) JavaScript
D) None of these
Answer: A) JavaScript

276. The full form of PHP is:
A) Hypertext Preprocessor
B) Hypertext Preprocessor
C) Hypertext Preprocessor
D) None of these
Answer: A) Hypertext Preprocessor

277. The full form of ASP is:
A) Active Server Pages
B) Active Server Pages
C) Active Server Pages
D) None of these
Answer: A) Active Server Pages

278. The full form of JSP is:
A) Java Server Pages
B) Java Server Pages
C) Java Server Pages
D) None of these
Answer: A) Java Server Pages

279. The full form of ASP.NET is:
A) Active Server Pages .NET
B) Active Server Pages .NET
C) Active Server Pages .NET
D) None of these
Answer: A) Active Server Pages .NET

280. The full form of J2EE is:
A) Java 2 Platform, Enterprise Edition
B) Java 2 Platform, Enterprise Edition
C) Java 2 Platform, Enterprise Edition
D) None of these
Answer: A) Java 2 Platform, Enterprise Edition

281. The full form of J2ME is:
A) Java 2 Platform, Micro Edition
B) Java 2 Platform, Micro Edition
C) Java 2 Platform, Micro Edition
D) None of these
Answer: A) Java 2 Platform, Micro Edition

282. The full form of J2SE is:
A) Java 2 Platform, Standard Edition
B) Java 2 Platform, Standard Edition
C) Java 2 Platform, Standard Edition
D) None of these
Answer: A) Java 2 Platform, Standard Edition

283. The full form of JDK is:
A) Java Development Kit
B) Java Development Kit
C) Java Development Kit
D) None of these
Answer: A) Java Development Kit

284. The full form of JRE is:
A) Java Runtime Environment
B) Java Runtime Environment
C) Java Runtime Environment
D) None of these
Answer: A) Java Runtime Environment

285. The full form of JVM is:
A) Java Virtual Machine
B) Java Virtual Machine
C) Java Virtual Machine
D) None of these
Answer: A) Java Virtual Machine

286. The full form of IDE is:
A) Integrated Development Environment
B) Integrated Development Environment
C) Integrated Development Environment

D) None of these
Answer: A) Integrated Development Environment

287. The full form of SDK is:
A) Software Development Kit
B) Software Development Kit
C) Software Development Kit
D) None of these
Answer: A) Software Development Kit

288. The full form of UI is:
A) User Interface
B) User Interface
C) User Interface
D) None of these
Answer: A) User Interface

289. The full form of UX is:
A) User Experience
B) User Experience
C) User Experience
D) None of these
Answer: A) User Experience

290. Which of the following is not a hardware?
A) Monitor
B) Mouse
C) MS Word
D) None of these
Answer: C) MS Word

291. Which of the following is not a software?
A) Keyboard
B) MS Excel
C) Windows
D) None of these
Answer: A) Keyboard

292. Which of the following is an input device?
A) Printer
B) Monitor
C) Keyboard
D) None of these
Answer: C) Keyboard

293. Which of the following is an output device?
A) Printer
B) Mouse
C) Scanner
D) None of these
Answer: A) Printer

294. Which of the following is a storage device?
A) Hard Disk
B) RAM
C) CPU
D) None of these
Answer: A) Hard Disk

295. Which of the following is a volatile memory?
A) RAM
B) ROM
C) Hard Disk
D) None of these
Answer: A) RAM