HELLO CODE

STUDY NOTES

Computer Science | External Examination Preparation

Covers: Computers • Hardware • Software • Internet • Scratch • Google Drive & more

01 What is a Computer?

Definition

A computer is an electronic device that processes data and performs tasks according to a set of instructions called programs. It can receive input, process it, store results, and produce output.

Key Characteristics

- Speed: Computers can perform millions of operations per second.
- Accuracy: Computers are extremely accurate — errors are usually caused by human mistakes in programming.
- Storage: Computers can store massive amounts of data permanently or temporarily.
- Automation: Once programmed, computers can repeat tasks without human involvement.

Real-World Examples

Where do we use computers?
Schools — for learning, research, and digital assignments
Hospitals — to maintain patient records and run medical equipment
Banks — for managing accounts and processing transactions
Shops — for billing, inventory tracking, and sales records
Internet — servers are powerful computers that run websites and apps

02 What is a Mouse?

Definition

A mouse is a hand-held input device that controls the movement of the cursor on a computer screen. Moving the mouse causes the pointer to move in the same direction. It connects to a computer via USB or wirelessly via Bluetooth.

Mouse Buttons and Functions

Action	Function
Left Click	Select or open an item
Double Left Click	Open a file or program
Right Click	Open a context menu with options
Scroll Wheel	Scroll up or down a page
Click and Drag	Move items around the screen

Types of Mice

- Mechanical Mouse: Uses a rubber ball to detect movement (older technology).
- Optical Mouse: Uses a laser or LED light to track movement on a surface.
- Wireless Mouse: Communicates with the computer via Bluetooth or a USB receiver.
- Trackpad: Built-in touch surface on laptops — acts as a mouse.

03 What is Hardware and Software?

Hardware — Definition

Hardware refers to all the physical, tangible parts of a computer that you can touch and see. These are the actual electronic and mechanical components that make up the machine.

Software — Definition

Software refers to the programs, applications, and operating systems that run on the hardware. Software is intangible — you cannot touch it. It provides instructions that tell the hardware what to do.

Hardware Examples	Software Examples
Monitor	Google Chrome (Web Browser)
Keyboard	Microsoft Word (Word Processor)
CPU (Processor)	Windows 11 (Operating System)
RAM (Memory)	Photoshop (Image Editor)
Hard Drive / SSD	Python (Programming Language)
Mouse	YouTube (Video Platform)

Key Idea Hardware without software is useless — like a car with no engine. Software without hardware cannot run. They depend on each other completely.

04 What are Input and Output Devices?

Input Devices — Definition

Input devices are hardware components that send data INTO the computer for processing. They allow users to give instructions and information to the computer.

Output Devices — Definition

Output devices are hardware components that receive processed data FROM the computer and display or present it to the user.

Input Devices	Output Devices
Keyboard — typing text and commands	Monitor — displays images and video
Mouse — navigating the screen	Printer — prints documents on paper
Microphone — recording voice	Speakers — playing audio and sound
Camera / Webcam — capturing images	Projector — displaying on large screen
Gamepad — game controls	LED Indicators — status lights
Touchscreen — touch input	Headphones — personal audio output

Remember the difference!

Input = Data going IN to the computer (user → computer)

Output = Data coming OUT of the computer (computer → user)

Some devices are BOTH: A touchscreen receives touch (input) and displays content (output).

05 What is a Desktop?

Definition — Desktop Computer

A desktop computer is a personal computer (PC) that is designed to be used at a fixed location, usually on a desk or table. It consists of separate components: a tower (the main unit), a monitor, keyboard, and mouse.

Definition — Desktop Screen (User Interface)

The desktop is also the name for the main screen you see after starting and logging into a computer. It is the starting point for all your work — like the surface of a real desk where you keep your tools and files.

Components of the Desktop Screen

Desktop Element	What It Does
Icons	Small images representing files, folders, or programs
Taskbar	Bar at the bottom showing open apps and system time
Start Menu	Central hub for accessing all programs and settings
Wallpaper	The background image on the desktop
Recycle Bin	Temporary storage for deleted files
Shortcuts	Quick links to frequently used programs

Desktop vs. Laptop

- Desktop: Larger, stays in one place, more powerful, uses separate parts.
- Laptop: Portable, battery-powered, has a built-in screen and keyboard.
- Both run the same software and perform the same general tasks.

06 What are Sensors?

Definition

A sensor is an electronic device that detects or measures physical conditions from the surrounding environment and converts that information into a digital signal that a computer can read and process. Sensors are what allow computers to interact with the physical world.

How Sensors Work

📌 Sensor Process (Step by Step)
Step 1: The sensor detects something in the real world (e.g., heat, light, motion).
Step 2: The sensor converts that measurement into an electrical signal.
Step 3: The signal is sent to a computer or microcontroller.

Step 4: The computer processes the data and takes action (e.g., turn on a fan).

Common Types of Sensors

Sensor Type	What It Detects / Used For
Temperature Sensor	Measures how hot or cold something is (e.g., thermostats, weather stations)
Motion Sensor	Detects movement of people or objects (e.g., security alarms, automatic lights)
Light Sensor	Detects brightness (e.g., phone screen auto-brightness)
Pressure Sensor	Measures force or weight (e.g., touchscreens, medical devices)
Proximity Sensor	Detects nearby objects without touching (e.g., phones turning off screen during calls)
Humidity Sensor	Measures moisture in the air (e.g., air conditioners, weather apps)
Sound Sensor	Detects sound levels (e.g., smart home voice controls)

07 Microsoft Paint

Definition

Microsoft Paint (also called MS Paint) is a simple, free graphics editing program included with all versions of Microsoft Windows. It allows users to create, edit, and save digital artwork and images. It is a great beginner tool for learning basic graphic design.

Key Features of MS Paint

Tool / Feature	What It Does
Pencil / Brush	Draw freehand lines or strokes
Shapes Tool	Insert rectangles, circles, triangles, and more
Text Tool (A)	Add text captions to your image
Fill (Paint Bucket)	Flood-fill an area with a selected color
Eraser	Remove parts of the drawing
Color Picker	Select any color from the image
Crop / Select	Select and cut a specific portion of the image
Resize	Change the canvas or image dimensions

Practical Uses of Microsoft Paint
Drawing simple diagrams and flowcharts
Editing screenshots (cropping, annotating)
Creating simple logos, banners, or artwork
Designing basic layouts or maps
Adding labels or captions to photos

08 Microsoft Word

Definition

Microsoft Word is a professional word processing application developed by Microsoft. It is the world's most widely used software for creating, editing, formatting, and printing documents. It is part of the Microsoft Office suite.

Key Features

Feature	Description
Text Formatting	Change font, size, bold, italic, underline, color
Spell Check	Automatically highlights and corrects spelling errors
Templates	Pre-designed layouts for letters, resumes, reports
Tables	Insert organized rows and columns of data
Images	Insert pictures, shapes, and diagrams
Headers & Footers	Add recurring text at top/bottom of every page
Page Numbering	Automatically number all pages
Track Changes	Record edits made by different users
Save as PDF	Export documents as PDF files

Common Uses of Microsoft Word
Writing essays, reports, and assignments
Composing professional letters and emails
Creating resumes and job applications
Making study notes and summaries
Designing certificates and newsletters

09 What are Problems? (Problem Solving in Computing)

Definition

In computing, a problem is any situation where the current state is different from the desired state and a solution needs to be found. Problem solving is the process of identifying a problem, analyzing it, designing a solution, and implementing it using a computer.

Steps of Problem Solving

The Problem-Solving Process
Step 1 — Understand the Problem: What exactly needs to be solved? What are the inputs and outputs?
Step 2 — Plan the Solution: Design an algorithm (a step-by-step plan). Use flowcharts or pseudocode.
Step 3 — Write the Code: Implement the solution in a programming language.
Step 4 — Test the Solution: Run the code with different inputs. Does it give the correct output?
Step 5 — Debug and Improve: Fix any errors (bugs) and optimize the solution.

Algorithm vs. Program

Algorithm	Program
A plan written in plain language or diagrams	Code written in a programming language
Does not run on a computer directly	Can be executed on a computer
Example: Steps to make tea	Example: Python code to calculate sum
Language-independent	Language-specific (Python, Java, etc.)

Example Problem	Problem: Calculate the average of 5 student marks. Input: 5 numbers. Process: Add them, divide by 5. Output: Display the average.

10 Scratch

Definition

Scratch is a free, visual programming language developed by MIT (Massachusetts Institute of Technology). Instead of typing code, users drag and drop colorful blocks to create programs. Scratch is designed specifically for beginners, especially children aged 8–16, to learn the basics of programming and logical thinking.

Key Concepts in Scratch

Scratch Concept	Explanation
Sprite	A character or object that performs actions in your project

Stage	The background area where sprites move and interact
Scripts	A collection of blocks that form a program for a sprite
Blocks	Color-coded command pieces you snap together to build code
Costume	Different looks/outfits for a sprite (used for animation)
Backdrop	The background image of the stage
Events	Triggers that start a script (e.g., 'when green flag clicked')
Loops	Repeat a set of blocks multiple times
Variables	Store and track changing values (like a score)

📌 What can you build in Scratch?
🎮 Simple games (maze, catch, quiz)
🎬 Animations and short stories
🖱️ Interactive greeting cards
📊 Simple simulations (e.g., traffic, weather)
🎨 Creative art and music projects

Why Learn Scratch?

- It teaches computational thinking: sequences, loops, conditions, and events.
- No syntax errors — blocks only connect if they make logical sense.
- Visual feedback makes it easy to see results immediately.
- Used worldwide in schools as the #1 first programming tool for students.

11 Google Drive

Definition

Google Drive is a free cloud-based file storage and synchronization service developed by Google. It allows users to store files online, access them from any device, and share or collaborate on documents with others in real time.

Storage Space

Google provides 15 GB of free storage with every Google account. Files can include documents, spreadsheets, presentations, images, videos, PDFs, and more.

Key Features

Feature	Description
Google Docs	Create and edit text documents (like Word)
Google Sheets	Create spreadsheets (like Excel)
Google Slides	Create presentations (like PowerPoint)
Google Forms	Build surveys, quizzes, and forms
File Sharing	Share files with specific people or make public links
Real-time Collaboration	Multiple people can edit the same file simultaneously
Auto-Save	All changes are saved automatically as you type
Access Anywhere	Available on computer, tablet, or smartphone
Offline Mode	Access files even without internet (if enabled)

📌 Practical Example — Student Use of Google Drive

1. Create a Google Doc for your assignment.
2. Share it with your teacher using their email address.
3. Your teacher can comment directly on the document.
4. Both of you can see changes in real time.
5. The file is safely stored in the cloud — never lost even if your laptop breaks.

12 What is the Internet?

Definition

The Internet is a global network of billions of computers and devices connected together using standardized communication protocols. It allows these devices to share and exchange information with each other from anywhere in the world at any time.

How the Internet Works

📌 Simple Explanation of How the Internet Works

1. You type a website address (URL) in your browser (e.g., www.google.com).
2. Your request is sent through your router to an Internet Service Provider (ISP).
3. The ISP connects you to the global internet.
4. The request reaches a DNS server which finds the website's IP address.
5. Your browser connects to the web server hosting that website.
6. The web server sends the website's data back to your browser.

7. Your browser displays the website on your screen.

Key Internet Terms

Term	Meaning
IP Address	A unique number that identifies every device on the internet (e.g., 192.168.1.1)
URL	Uniform Resource Locator — the address of a specific webpage
DNS	Domain Name System — translates website names to IP addresses
ISP	Internet Service Provider — the company that gives you internet access
Browser	Software used to access websites (Chrome, Firefox, Edge)
Wi-Fi	Wireless technology for connecting devices to the internet
Server	A powerful computer that hosts websites and stores data
Protocol	A set of rules for how data is sent across the internet (e.g., HTTP, HTTPS)

Uses of the Internet

- Communication: Email, video calls, social media, instant messaging.
- Education: Online courses, research, digital libraries, tutorials.
- Entertainment: Streaming music, videos, gaming, and social platforms.
- Commerce: Online shopping, banking, and business services.
- Information: News websites, search engines, encyclopedias like Wikipedia.

13 What are Websites?

Definition

A website is a collection of related web pages that are grouped under a single domain name and accessible via the Internet. Each web page is a document that can contain text, images, videos, links, and interactive features.

Parts of a Website URL

📌 Breaking down: https://www.google.com/search

https:// — Protocol (secure connection using HTTPS)

www.	— Subdomain (World Wide Web)
google.com	— Domain name (the website's unique address)
/search	— Path (the specific page on the website)

Types of Websites

Type of Website	Example
Search Engine	Google, Bing — used to find other websites
Social Media	Facebook, Instagram, TikTok — share posts and connect
E-Commerce	Amazon, Daraz — buy and sell products online
Educational	Khan Academy, Coursera — learn new subjects
News	BBC, Dawn News — read current events
Entertainment	YouTube, Netflix — watch videos and shows
Government	Pakistan.gov.pk — public services and information
Email	Gmail, Outlook — send and receive emails

How Websites Are Built

- HTML (HyperText Markup Language): Creates the structure and content of the page.
- CSS (Cascading Style Sheets): Controls the appearance and layout (colors, fonts).
- JavaScript: Adds interactivity and dynamic behavior to websites.
- A web server hosts all these files and sends them to your browser when you visit.

Fun Fact

There are over 2 billion websites on the internet, but only about 200 million are actively used. The first website ever created was by Tim Berners-Lee in 1991 at CERN.