Computer Workshop

* Computer → A computer is a machine that can be instructed to carry out sequences of arithmetic or logical operations automatically via computer programming.

* Programs → Generalised set of operations that the computers follow.

* Computer System → A complete computer including the hardware, the operating system and the peripheral equipment required for full operation.

* Computer Cluster → A group of computers that are connected and work together.

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            Computer
    ┌───────────┴───────────┐
    ↓                       ↓
 Hardware                Software
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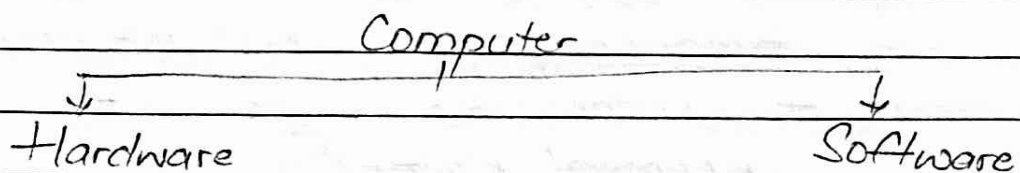
Hardware → The physical components of a computer.

Software → Source of interaction between the user and the computer. It represents programs, collection of several sets of instructions, which allow the hardware to run properly.

* Input Devices → Hardware equipment that receive data and instructions from users, convert the data and instructions into a form that can be processed by the computer.
Example : Keyboard, Mouse, Scanner, Joystick

* Output Devices : Hardware equipment that translates the non-readable form to ~~user~~ a form understood by the user.
Example : VDU (Visual Display Unit) or Monitor, Printer, Headphones

* CPU → Central Processing Unit
It is the master organ of the computer.
No computer can exist without a CPU
It is composed of two units
  — ALU (Arithmetic Logic Unit)
  — CU (Control Unit)
CU controls all the activities of other hardware units while ALU perform the calculations.

* Memory or Storage → A hardware component where computer stores all the data and instructions given to it. The results of processing are also stored here.
Types of Memory :-
- Primary Memory
- Secondary Memory
- Cache Memory

* Primary Memory → Directly connected to CPU and is extremely fast as far as storage and retrieval of data is concerned.
  Types of primary memory:-
- RAM (Random Access Memory)
- ROM (Read Only Memory)

* Difference b/w RAM & ROM:-

RAM	ROM
Random Access Memory	Read Only Memory
Volatile Memory	Non-volatile memory
Stores data temporarily.	Stores data permanently
Fast	Slow as compared to RAM
Large size with higher capacity	Small size with less capacity.
Costlier	Cheaper than RAM

* Motherboard → Main purposes of motherboard:-
- Provides electrical power to individual component.
- Allow the components to communicate with each other.
- Holds the components in place.

* Sizes of motherboard:-
- Standard ATX (Desktop PC)
- Micro ATX (Laptop)
- Mini ATX (Smart phones)

* Types of Software:-
- Application Software
- System Software

* System software → The software that operates directly on hardware devices. of computer. It provides a platform to run an application. It provides and supports user functionality.
Example: Windows, Linux, Unix.

* Application Software → Software designed for the benefit of users to perform one or more tasks.
Example: Microsoft word, excel, powerpoint.

* Keyboard → Similar to a miniature computer. It has its own processor and circuitary that carries information to and from that processor.
Key matrix → A grid of circuits underneath the keys.

* Working of keyboard → In the keyboard, each circuit is broken. Pressing any of the key, presses a switch and completes the circuit allowing a small amount of current to flow through. When the processor finds a circuit that is closed, it compares the location of that circuit on the key matrix to character map stored in ROM.

* Character Map → A comparison chart with which the positions of keys on the key matrix is matched.

* Keyboard Keys
- Basic Keys : QWERTY (starting with letter Q and ending at M), Numbers, Symbols, Spacebar, Arrows.
- Modifier Keys: Shift, Alt, Ctrl
- Other Keys: Numpad, Caps Lock, Num Lock, Insert, Home, End, Page Up, Page Down, PrtScn
- Function Keys.

Motherboard

* Other names → Mainboard, MoBo (short form)

* PCB → printed circuit board
  Motherboard is also known as PCB as everything is printed on it.

* Types of Motherboards :-
  — AT (No Longer used)
  — ATX

* Difference b/w AT and ATX :-

AT	ATX
Advanced Technology	Advanced Technology Extended
Two power connectors of 6 pin each.	Single connector
Difficult for new drives to get installed.	New drives installed easily.
Less stable power	More stable power.
More power drain.	Less power drain
Doesnot have sleep mode feature	It has sleep mode feature.

* Features of ATX :-
  — More stable power
  — More clearance around CPU socket
  — Wider gaps between expansion slots.

* *Motherboard Components*

1. USB Ports ⟶ Universal Serial Bus Port

A Port that allows electronic devices to be connected to the computer via cables.

Features :-
- All kinds of external USB devices can be connected.
- Data travels at 12 megabits per second.
- USB devices can get power from USB port.

Types of USB port (on basis of speed)
- USB 1.1 (12 Mb/s)
- USB 2.0 (480 Mb/s)
- USB 3.0 (5 Gb/s)

Types of USB port (on basis of size)
- USB A (back of computer)
- USB B (printers / scanners)

Parallel port ⟶ transmits all 8 bits of data in parallel. ⟶ for printers and scanners.
Serial port ⟶ transmits data 1 bit after another.
  ↳ for modems.

2. Expansion Slots ⟶ A slot that allows a computer hardware expansion card to be connected to computer system via expansion bus.
- An expansion slot allows the user to replace to video card without replacing the motherboard.

- AGP → Video card
- PCI → Network card, sound card
- PCI Express → Video card, Modem, Sound card, Network card.

* AGP → Accelerated Graphics Port → advanced port for video cards.

* Data bus → A cable that carries information to and from the computer memory to CPU.

* 32 bit v/s 64 bit
A CPU of 64 bit has a data bus that is 64 bit wide that can transfer 64 bits of data at a time.
A CPU of 32 bit can transfer 32 bits at a time.

* PCI → peripheral component interconnect
Uses:-
- Provides a common interface
- For adding network or sound card to the computer.

* Difference b/w PCI & PCI Express

PCI	PCI-Express
Peripheral Component Interconnect.	Peripheral Component Interconnect Express.
Slow	Fast
Parallel Interface	Serial Interface.
Speed is upto 133Mb/s	Speed is upto 16Gb/s

- Data transmitted over PCI Express is sent over wires (lanes).

* Types of PCIe :-
- PCIe X16
- PCIe X1

* Laptops donot have expansion slots.

3. Case Fan → System fan → helps in bringing into and blowing hot air out of the case.

4. Case Fan Connector → connects the case fan to the motherboard.

* Color coded connections
- Keyboard → Purple
- Mouse → Green
- Serial → Cyan
- Printer → Violet
- Monitor (VGA) → Blue
- Monitor (DVD) → White
- Line Out (Headphones) → Lime Green
- Line in (Microphone) → Pink
- Audio in (Grey) →
- Joystick → Yellow.

HSF → heat Sink and fan

5. Heat Sink → to reduce the temperature of a hardware component.
Types of heat sink :-
- Active Heat Sink
- Passive Heat Sink

Active heat sink → It utilize the computer power supply and may include a fan.

Passive heat sink → they have no mechanical components.

* Components that generate most heat → CPU, video card, power supply.

* Inductor → Short for electromagnetic coil
     Stores magnetic energy.
     Opposes a change in current.

* Capacitor → Stores electrical energy
          Opposes a change in voltage.
When a motherboard capacitor fail, the computer will no longer boot.

* CPU Socket → The connection between computer processor and motherboard.

- More capable CPU, more pins on the socket

- Pins on the socket used to send and receive

data on motherboard.

* North Bridge → towards FSB (front sided bus)
~~north of~~

Function → Manage communication b/w the CPU and parts of motherboard.

Other names → Host Bridge, Memory Controller Hub.

* South Bridge → south of PCI (location)

Function → Control input/output functioning.

Other names → IO Controller Hub.

- North bridge connects south bridge and CPU.

- South bridge and North Bridge both replaced by PCH
↓
platform controller hub.

* Difference b/w North and South Bridge

NB	SB
towards FSB in north of motherboard.	south of PCI
connected directly to CPU	connected to CPU via north bridge
manages communication between CPU and other parts of motherboard.	manages input and output functions.
faster	slower
other names: Memory controller hub, host bridge	Other name: IO Controller Hub.
Bigger	Smaller

MCH → memory controller hub

* PCH → platform controller hub
  ↓
  connected to CPU via DMI
                        ↓
                direct media interface.

- Some north bridge functions including
  memory controller, graphics card interface
  were integrated into the CPU.
  Other function of north bridge and all the
  functions of south bridge were migrated to
  PCH.

* Memory Slots → allows RAM to be inserted
  ↓   into the computer
  2 to 4 slots

- Bottom edge of memory module → Gold plated
                        pins (total 240 pins, 120 on
                        each side) to prevent from
                        rusting.

* SATA → serial advanced technology attachment
  ↓
  for connecting disk drives, hard drives
  ↓
  Data transfer speed → 1.5 to 6 Gb/s

* Difference b/w SATA and PATA

SATA	PATA
– Serial Advanced Technology Attachment	Parallel Advanced Technology Attachment
– 7 pin connector	40 pin connector
– Speed of data transfer is high	Speed of data transfer is lower.
– Power consumption is less	Power consumption is more.
– Cable size is smaller.	Cable size is bigger.

* Jumpers ⟶ Allow the computer to close an electrical circuit, allowing the electricity to flow on a circuit board.

* BIOS ⟶ Basic Input Output System
   ↳ integrated chip ⟶ contains all information and setting of motherboard.

– When powered on, first software to run ⟶ BIOS
                                                                    firmware

* Roles of BIOS ⟶ load OS

* CMOS Battery ⟶ provides power to BIOS when computer is off.
   ↓
complementary metal oxide semiconductor.
   ↓
3V lithium rechargable battery.
   ↓
also stores date and time.

* Laptops → Also known as notebooks.
↓
portable computers with in built keyboard
and trackpad, which serves as mouse.

– Disassembling → parting the different components
of computer from the system unit.

* Bootstrapping process → Booting of the computer.
– Reading the program to load OS
– Then starting device drivers.