इन्फॉर्मेटिक्स प्रैक्टिसेज
Informatics Practices

कक्षा / Class XI
2026-27

विद्यार्थी सहायक सामग्री
Student Support Material

केन्द्रीय विद्यालय संगठन~Kendriya Vidyalaya Sangathan

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संदेश

शिक्षा केवल पुस्तकों तक सीमित ज्ञान नहीं है; यह स्वयं को पहचानने, अपने विचारों को विस्तार देने और जीवन की चुनौतियों का आत्मविश्वास से सामना करने की सतत् यात्रा है। केन्द्रीय विद्यालय संगठन का सदैव यह प्रयास रहा है कि प्रत्येक विद्यार्थी के लिए ऐसा शिक्षण वातावरण हो, जहाँ जिज्ञासा को प्रोत्साहन मिले, सीखना आनंददायी बने और प्रत्येक बालक अपनी अंतर्निहित क्षमताओं को पहचानकर उन्हें विकसित कर सके।

राष्ट्रीय शिक्षा नीति 2020 ने शिक्षा को सिर्फ रटने से समझने, सूचना से ज्ञान और ज्ञान से जीवनोपयोगी दक्षताओं की ओर अग्रसर किया है। आज का समय कृत्रिम बुद्धिमत्ता (Artificial Intelligence – AI), डिजिटल नवाचार और निरंतर बदलती तकनीकों का है। ऐसे युग में केवल तथ्यों का ज्ञान पर्याप्त नहीं है; आवश्यक है कि विद्यार्थी मनन- चिंतन करना सीखें, प्रश्न पूछें, समस्याओं का समाधान खोजें और नए विचारों के साथ आगे बढ़ें। यही क्षमताएँ उन्हें भविष्य के लिए तैयार करेंगी।

इन्हीं उद्देश्यों को ध्यान में रखते हुए केन्द्रीय विद्यालय संगठन के पाँचों आंचलिक शिक्षा एवं प्रशिक्षण संस्थानों (ZIETs) के माध्यम से, समर्पित एवं अनुभवी शिक्षकों द्वारा कक्षा 9 से 12 के विद्यार्थियों के लिए यह विद्यार्थी सहायक सामग्री तैयार की गई है। यह केवल परीक्षा की तैयारी की संकलन सामग्री नहीं है, बल्कि विषयों को सरलता से समझने, अवधारणाओं को स्पष्ट करने, नियमित अभ्यास करने और आत्मविश्वास के साथ आगे बढ़ने का एक विश्वसनीय साथी है।

इस सामग्री में विषय-वस्तु को विद्यार्थियों की आवश्यकताओं के अनुरूप सरल, व्यवस्थित एवं दक्षता-आधारित दृष्टिकोण से प्रस्तुत किया गया है। मुझे प्रसन्नता है कि इसे हमारे शिक्षकों के अनुभव, नवाचार और विद्यार्थियों के प्रति उनकी प्रतिबद्धता ने समृद्ध बनाया है। मुझे विश्वास है कि यह सामग्री विद्यार्थियों की सीखने की यात्रा को अधिक सहज, रोचक और प्रभावी बनाएगी तथा उन्हें बोर्ड परीक्षाओं के साथ-साथ जीवन की व्यापक चुनौतियों के लिए भी तैयार करेगी।

मेरा विश्वास है कि जब एक जिज्ञासु विद्यार्थी, प्रेरित शिक्षक और सार्थक शिक्षण संसाधन एक साथ आते हैं, तब शिक्षा केवल उपलब्धि का माध्यम नहीं रहती, बल्कि व्यक्तित्व निर्माण की एक सशक्त प्रक्रिया बन जाती है। यही भावना इस विद्यार्थी सहायक सामग्री के केंद्र में है।

मेरी हार्दिक शुभकामनाएँ हैं कि आप सभी सीखने की इस यात्रा में निरंतर आगे बढ़ें, अपने सपनों को नए आयाम दें और ज्ञान, संवेदनशीलता तथा नवाचार के साथ राष्ट्र निर्माण में अपना महत्वपूर्ण योगदान दें।

शुभकामनाओं सहित।

(विकास गुप्ता)

STUDENT SUPPORT MATERIAL

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CONTENTS

S NO	TOPIC	PAGE NO.
1	SYLLABUS	1-2
2	Unit -1 **Introduction to Computer System**	
	✓ Introduction to Computer and computing	3
	✓ Computer Memory	5
	✓ Software: Purpose and types of software	7
3	Unit-2 **Introduction to Python**	
	✓ Basics of Python programming	19
	✓ Statements	30
	✓ Lists in Python	45
	✓ Dictionary in Python	53
	✓ Introduction to NumPy	60
4	**Unit 3: Database concepts and SQL**	
	✓ Database Concepts	69
	✓ Structured Query Language	73
5	**Unit 4: Introduction to the Emerging Trends**	101
6	Solved Sample Question Papers (1 paper)	114
7	Unsolved Sample Questions Papers (3 papers)	128
8	Web Links	148

INFORMATICS PRACTICES
Subject Code - 065 Class XI (2026-2027)
SYLLABUS

1. Prerequisite. None
2. **Learning Outcomes**: At the end of this course, students will be able to:
   - Identify the components of computer system.
   - Create Python programs using different data types, lists and dictionaries.
   - Understand database concepts and Relational Database Management Systems.
   - Retrieve and manipulate data in RDBMS using Structured Query Language
   - Identify the Emerging trends in the fields of Information Technology.
3. **Distribution of Marks:**

Unit No.	Unit Name	Marks
1	Introduction to Computer System	10
2	Introduction to Python	25
3	Database Concepts and the Structured Query Language	30
4	Introduction to Emerging Trends	5
	Practical	30
	Total	100

Unit Wise syllabus:

Unit 1: Introduction to Computer System

Introduction to computer and computing: evolution of computing devices, components of a computer system and their interconnections, Input/output devices.
Computer Memory: Units of memory, types of memory – primary and secondary, data deletion, its recovery and related security concerns.
Software: purpose and types – system and application software, generic and specific purpose software.

Unit 2: Introduction to Python

Basics of Python programming, execution modes: - interactive and script mode, the structure of a program, indentation, identifiers, keywords, constants, variables, types of operator, precedence of operators, data types, mutable and immutable data types, **statements**: expression evaluation, comments, input and output statements, data type conversion, debugging.
Control Statements: if-else, if-elif-else, while loop, for loop

Lists: list operations - creating, initializing, traversing and manipulating lists, list methods and built-in functions – len(), list(), append(), insert(), count(), index(), remove(), pop(), reverse(), sort(), min(), max(), sum()

Dictionary: concept of key-value pair, creating, initializing, traversing, updating and deleting elements, dictionary methods and built-in functions – dict(), len(), keys(), values(), items(), update(), del(), clear()

Introduction to NumPy: Introduction, Creation of NumPy Arrays from List

Unit 3: Database concepts and the Structured Query Language

Database Concepts: Introduction to database concepts and its need, Database Management System.

Relational data model: Concept of domain, tuple, relation, candidate key, primary key, alternate key Advantages of using **Structured Query Language**, Data Definition Language, Data Query Language and Data Manipulation Language, Introduction to MySQL, creating a database using MySQL, Data Types

Data Definition: CREATE DATABASE, CREATE TABLE, DROP, ALTER

Data Query: SELECT, FROM, WHERE with relational operators, BETWEEN, logical operators, IS NULL, IS NOT NULL

Data Manipulation: INSERT, DELETE, UPDATE

Unit 4: Introduction to the Emerging Trends

Artificial Intelligence, Machine Learning, Natural Language Processing, Immersive experience (AR, VR), Robotics, Big data and its characteristics, Internet of Things (IoT), Sensors, Smart cities, Cloud Computing and Cloud Services (SaaS, IaaS, PaaS); Grid Computing, Block chain technology.

Practical Marks Distribution

Sr. No.	Unit Name	Marks
1	Problem solving using Python programming language	11
2	Creating database using MySQL and performing Queries	7
3	Practical file (minimum of 14 python programs, and 14 SQL queries)	7
4	Viva-Voce	5
	Total	30

5. Suggested Practical List

5.1 Programming in Python

1. To find average and grade for given marks.
2. To find sale price of an item with given cost and discount (%).
3. To calculate perimeter/circumference and area of shapes such as triangle, rectangle, square and circle.
4. To calculate Simple and Compound interest.
5. To calculate profit-loss for given Cost and Sell Price.
6. To calculate EMI for Amount, Period and Interest.
7. To calculate tax - GST / Income Tax.
8. To find the largest and smallest numbers in a list.
9. To find the third largest/smallest number in a list.
10. To find the sum of squares of the first 100 natural numbers.
11. To print the first 'n' multiples of given number.
12. To count the number of vowels in user entered string.
13. To print the words starting with an alphabet in a user entered string.
14. To print number of occurrences of a given alphabet in each string.
15. Create a dictionary to store names of states and their capitals.
16. Create a dictionary of students to store names and marks obtained in 5 subjects.
17. To print the highest and lowest values in the dictionary.

5.2 Data Management: SQL Commands

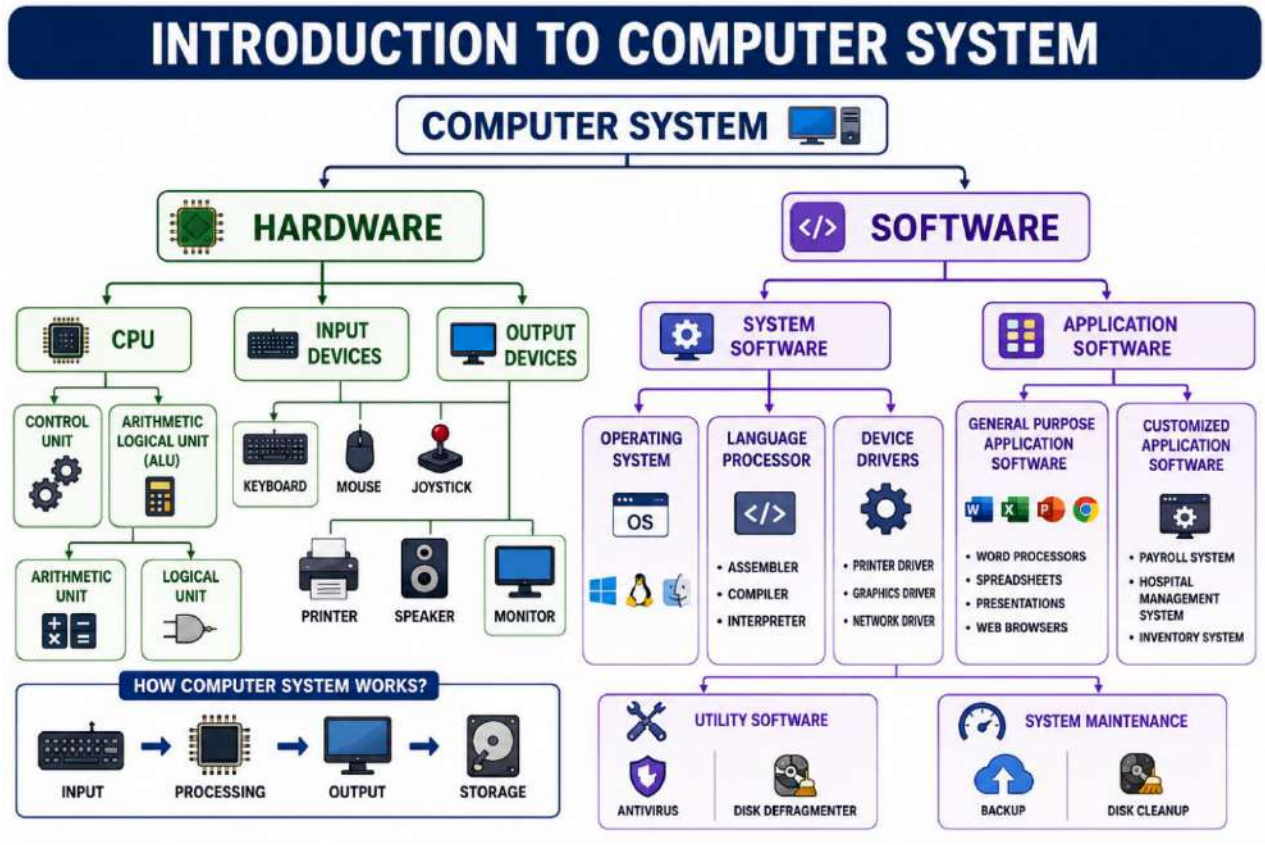
1. To create a database
2. To create student table with the student id, class, section, gender, name, dob, and marks as attributes where the student id is the primary key.
3. To insert the details of at least 10 students in the above table.
4. To display the entire content of table.
5. To display Rno, Name and Marks of those students who are scoring marks more than 50.
6. To display Rno, Name, DOB of those students who are born between '2005- 01-01' and '2005-12-31'.

Suggested material

NCERT Informatics Practices - Text book for class - XI (ISBN- 978-93-5292-148-5)

Unit 1: Introduction to Computer System

Mind Map

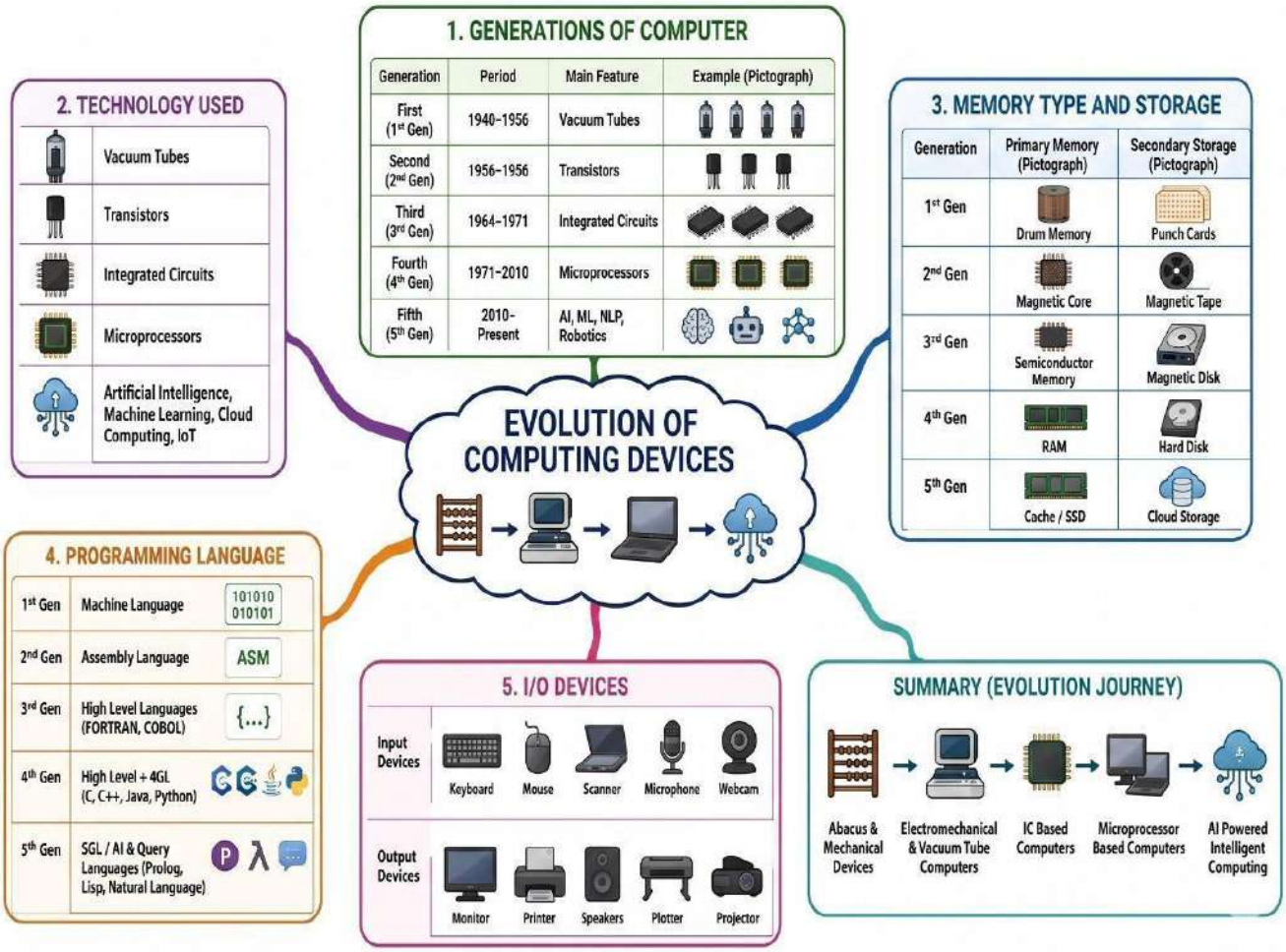


1. Introduction to Computers & Computing

- **Definition:** A computer is an electronic device that processes input data and provides the output based on the input data.

2. Evolution of Computing Devices

Generations of computer	Technology used	Memory Type and Storage	Programming Language	I/O Devices
First Generation	Vacuum Tubes	Magnetic Drums Magnetic tape	Machine Language	Punch Card
Second Generation	Transistors	Magnetic Tape	Machine Language and Assembly Language	Typewriters attach to control panel, punch cards
Third Generation	Integrated Circuits	Hard Disk, Floppy Disk, Magnetic Core, RAM	High Level Language developed	Keyboard, Printer
Fourth Generation	Microprocessors and Very Large-Scale Integrated circuits	Hard Disk, Floppy Disk, CD, DVD	High Level Language	Keyboard, mouse, Printers, Plotter, Speaker
Fifth Generation	Parallel Processing and Super Conductors	Hard Disk, DVD, Flash Memory, Cloud Storage	High Level Language, Cloud Based Programming	Keyboard, mouse, Printers, Plotter, Speaker

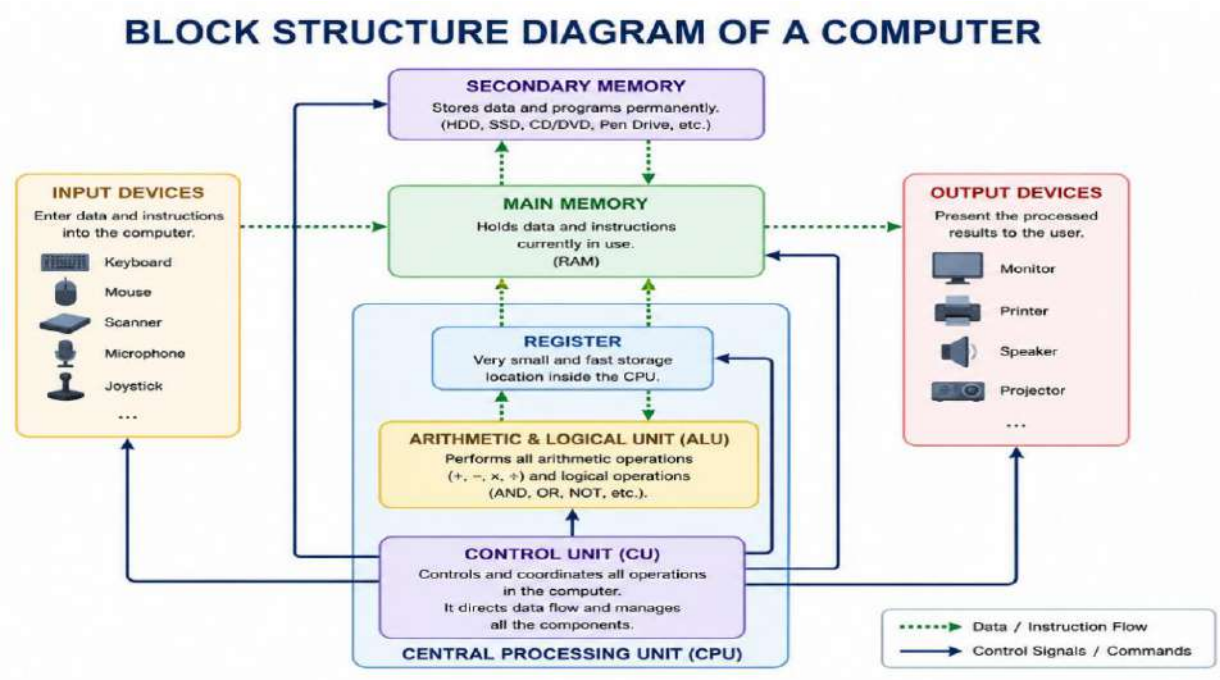


3. **Components of a computer system:**

- **Components:** The **hardware** includes the **CPU, memory, input/output devices, and storage**.
- **CPU:** The "brain" of the computer, consisting of:
  - **ALU** (Arithmetic and Logical Unit)**:** Performs arithmetic & logical operations.
  - **Control Unit:** Manages instruction execution.
  - **Registers:** Used to access data and instructions from memory during of the execution of instructions.

- **Input Devices:** An input device or hardware that allow the user to input data, instructions to the computer. Some common input devices are keyboard, mouse, scanner, webcam, barcode reader etc.

- **Output Devices:** An output device or hardware that retrieves and presents the result/information on the basis of input data in human understandable language. Some Common output devices are Monitor, printer, speakers, plotter etc.



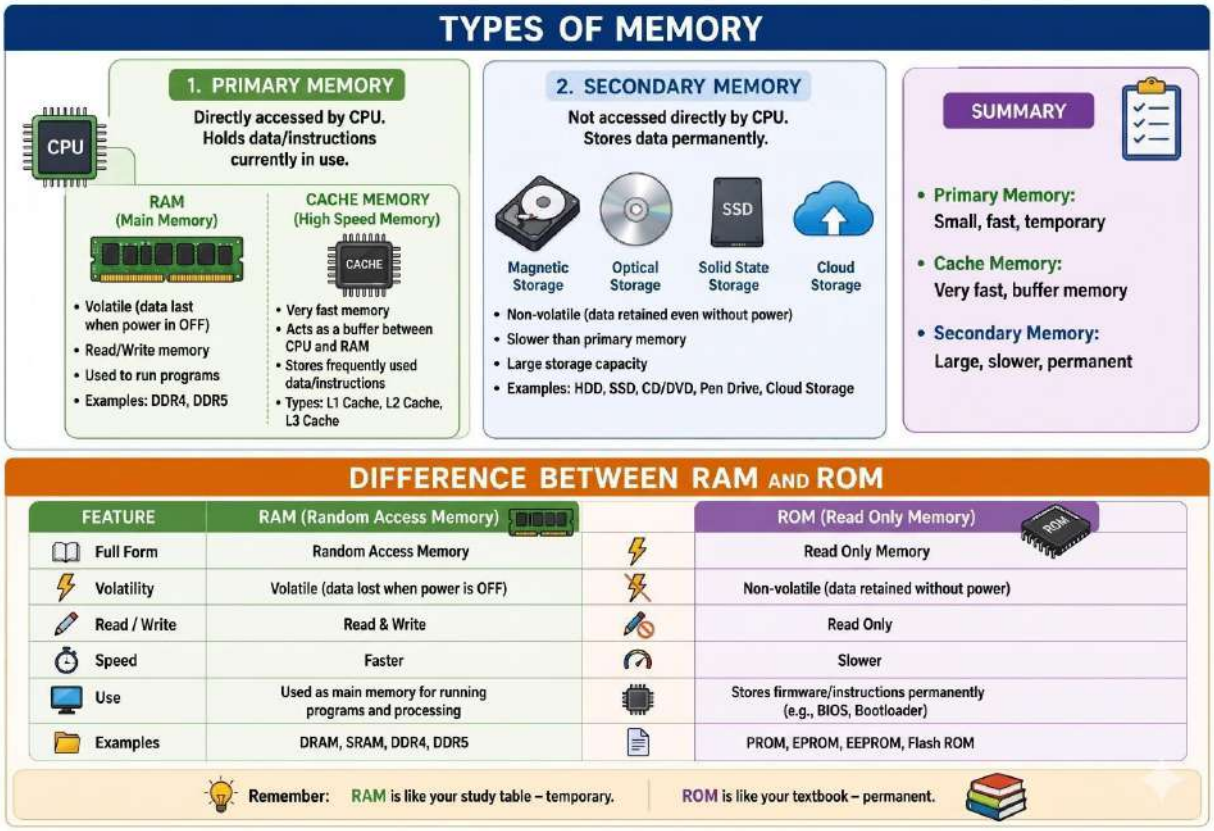
4. **Computer Memory**

It is used to store data / information temporarily or permanently.

- **Units:** From **bit (smallest)** to **Yottabyte (largest)**.
  bit->Nibble(4 bit)->Byte(8 bit)->KB->MB->GB->TB->PB-> EB->ZB->YB

KB-1024 Bytes	**PB**- 1024 GB
MB- 1024 KB	**EB**- 1024 PB
GB- 1024 MB	**ZB**- 1024 EB
TB- 1024 GB	**YB**- 1024 ZB

- **Types of memory:**



Primary Memory:

- **RAM (Volatile) – Random Access Memory** stores data temporarily.
  - It is a **volatile memory** that means it lose the data when power is turned off.
  - A computer can't operate/run without primary memory.
  - It is faster than secondary storage memory.
  - Types of RAM (SRAM, DRAM)
- **ROM (Non-volatile) –** It retains the information, even when the power is turned off. It stores the boot-up instructions (primarily used to start a computer). Instructions in the ROM are written by the programmer, which are called firmware and BIOS.

Types of ROM:

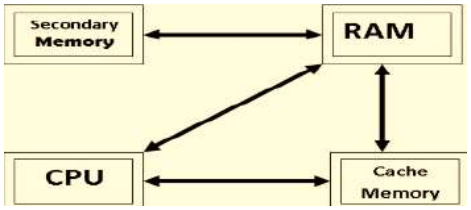
- PROM Programmable Read Only Memory
- EPROM Erasable Programmable Read Only Memory
- EEPROM Electronic Erasable Read Only Memory

Cache Memory:

Cache memory is a small, high-speed memory located inside or very close to the CPU. It temporarily stores frequently accessed data and instructions so the CPU can retrieve them much faster than from the main memory (RAM). This reduces data access time, improves processing speed, and increases overall system performance. Cache memory is more expensive and has a smaller storage capacity as compare to RAM.

☐ It helps in **reducing the time** taken to access data, thereby improving the overall performance of the computer.

- High-speed temporary storage between CPU & RAM.



Secondary Memory:

Secondary memory is used for the permanent storage of data, files, software, and the operating system. it is non-volatile Memory meaning data is not lost when the computer is turned off.

➤ **Characteristics of Secondary Memory:**

- It is not directly accessible by the CPU; data must be loaded into primary memory (RAM) before processing.
- It has large storage capacity compared to primary memory.
- It is slower than primary memory, but suitable for long-term data retention.

➤ **Examples of Secondary Storage Devices:**

Hard Disk Drive (HDD), Solid State Drive (SSD), Optical Disks (CD/DVD), Flash Drives (Pen Drive, Memory Cards/SD Cards)

5. Software:Purpose and Types of Software (Follow Mind Map given in the beginning of the chapter)

Software is a collection of programs that enables hardware to function. It governs the operations of a computer system and is used for various purposes.

There are three types of software:

A. System Software: It act as an interface between user and hardware. System software is a type of software that controls and manages the hardware components of a computer and helps to install or run application software.

a) Operating System (OS):

- Acts as an interface between user and hardware.
- Manages files, memory, processes, and devices.
- Examples: Windows, Linux, macOS, Android

b) System Utilities:

- Programs that perform maintenance and support tasks.
- Examples: Antivirus, Disk Cleanup, File Compression Tools (WinZip)

c) Device Drivers:

- Specialized software that allows the OS to communicate with hardware devices.
- Each device (printer, keyboard, etc.) needs its own driver.
- Example: Printer Driver, Graphics Driver

B. Programming Tools and Language Translators

Used by programmers to write, convert, and debug programs written in high-level or low-level programming languages.

a) Assembler	b) Compiler	c) Interpreter
Translates assembly language into machine code.	Converts the entire source code (high-level language) into machine code at once.	Translates code into machine language one line at a time and execute it.
One-to-one conversion.	Fast execution after compilation.	Slower than a compiler.
Used in low-level Language programming. Example: Assembly Language	Used in High-level Language Programming Example: C, C++ compilers	Used in High-level Language Programming Example: Python, JavaScript interpreter

C. Application Software

Application software is designed to help users to perform specific tasks or activities.

Types:

- **General-purpose software** – used by most users.
  - **Examples:** MS Office, databases, email clients.
- **Special-purpose software** – Custom-built for organizations and developed for a specific task.
  - **Examples**: Billing Software, Library Management System, Railway reservation software.

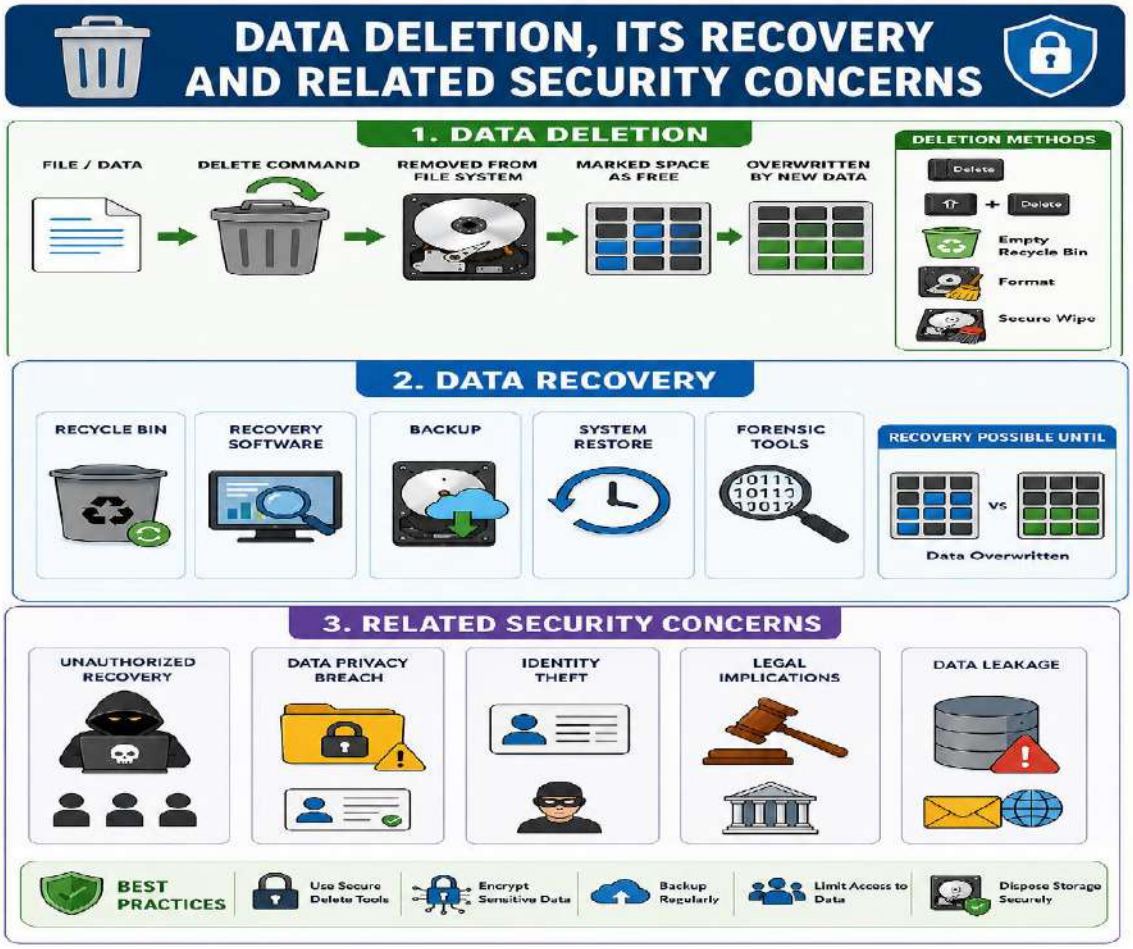
6. Data deletion, its recovery and related security concerns

Data deletion is related to the loss of data, removal of data from a storage device either intentionally or accidentally. Data is also lost due to virus/ bad sectors/ by hackers.

Data recovery is related to the recovery of lost data with the help of data recovery software.

Data Security: It is very important for the user to implement the Data security concerns before working on computer because it helps a user to prevent unauthorized access and loss of data.

Some Security measures are (1) install antivirus software (2) Don't allow unauthorized access of data (3) Try not to use public network. (4) apply strong login password



Multiple Choice Questions

1	You are explaining computers to someone from a non-technical background. How would you classify a computer based on its functioning? a) Mechanical b) Electrical c) Electronic d) Telecommunication
2	The physical components of the computer are known as: a) Software b) Program c) Hardware d) Both a) and c
3	Which of the following is **not** a component of computer system? a) Processor b) MS Office c) Motherboard d) Keyboard
4	Arrange the following in increasing order of the number of transistors on a single chip: i) SLSI , ii) IC , iii) VLSI , iv) LSI a) ii) IC → iv) LSI → iii) VLSI → i) SLSI b) ii) IC → iii) VLSI → iv) LSI → i) SLSI c) iv) LSI → ii) IC → iii) VLSI → i) SLSI d) i) SLSI → ii) IC → iii) VLSI → iv) LSI
5	Which of the following is the fastest memory? a) RAM b) Cache c) ROM d) Hard Disk
6	Which two digits does the binary number system consist of? a) 1, 2 b) 0, 1 c) a, b d) i, ii

7	Which of the following is a volatile memory? a) RAM b) CD c) ROM d) Hard Disk
8	Arrange the following units of memory in decreasing order of storage: i) KB (Kilobyte) ii) GB (Gigabyte) iii) MB (Megabyte) iv) TB (Terabyte) a) iv) TB → ii) GB → iii) MB → i) KB b) ii) GB → iv) TB → i) KB → iii) MB c) iv) TB → iii) MB → i) KB → ii) GB d) iv) TB → ii) GB → i) KB → iii) MB
9	Which of the following is NOT an input device? a) Scanner b) Speakers c) Webcam d) Joystick
10	A _____ is an electronic pathway composed of cables that connects the major parts of a computer system. a) Motherboard b) Processor c) Bus d) Cache

Answer (Multiple Choice Questions)

1	(c) Electronic
2	(c) Hardware
3	(b) MS Office
6	(a) ii) IC → iv) LSI → iii) VLSI → i) SLSI
7	(b) Cache
8	(b) 0, 1
9	(a) RAM
10	(a) iv) TB → ii) GB → iii) MB → i) KB
11	(b) Speakers
12	(c) Bus

Assertion and Reasoning Questions

Choose correct option for given Assertion (A) and Reasoning (R) a) Both A and R are true, and R is the correct explanation of A. b) Both A and R are true, but R is NOT the correct explanation of A. c) A is true, but R is false. d) A is false, but R is true.	
1	**Assertion (A):** Computers use binary code (0s and 1s) to represent and process data. **Reason (R):** Binary code is the fundamental language of computers, where 0 represents OFF and 1 represents ON in the context of electronic switches.
2	**Assertion (A):** Main/Primary memory is volatile. **Reason (R):** ROM, which is a part of main memory, is non-volatile
3	**Assertion (A):** It is always good to keep passwords encrypted while storing. **Reason (R):** Encrypted data cannot be easily stolen by hackers.
4	**Assertion (A):** RAM (Random Access Memory) is volatile memory. **Reason (R):** RAM retains its data even when the computer is powered off.
5	**Assertion (A):** Software designed for a school will work only for the school admin. **Reason (R):** Customized software is tailor-made according to user requirements
6	**Assertion (A):** Cache memory is faster than RAM. **Reason (R):** Cache memory is placed between the processor and RAM to reduce the access time.
7	**Assertion (A):** ROM (Read-Only Memory) is used to store data that does not change frequently. **Reason (R):** ROM is volatile memory and loses data when the power is turned off.
8	**Assertion (A):** An operating system is an example of system software. **Reason (R):** An operating system provides an interface between hardware and software applications.

Answer (Assertion and Reasoning Questions)

1	(a) Both A and R are true, and R is the correct explanation of A
2	(b) Both A and R are true, but R is NOT the correct explanation of A.
3	(a) Both A and R are true, and R is the correct explanation of A
4	(c) A is true, but R is false.
5	(d) A is false, but R is true.
6	(a) Both A and R are true, and R is the correct explanation of A.
7	(c) A is true, but R is false.
8	(a) Both A and R are true, and R is the correct explanation of A.

Very Short Questions with Answers

1	Explain the role of an ALU in processing operations within a CPU.
	Answer: The ALU (Arithmetic Logic Unit) performs arithmetic operations like addition and subtraction, and logical operations such as comparisons, essential for processing instructions.
2	Identify the type of memory that loses data when power is turned off and justify its use.
	Answer: RAM (Random Access Memory) is volatile; it temporarily holds data and instructions that the CPU is actively using for faster access.
3	Explain the use of utility software by naming one and describing its function.
	Answer: Antivirus software like Windows Defender scans and removes malware, ensuring system security and performance.
4	Earlier the computer size is used to be very big, but now it is very compact. What do you think the reason behind its change?
	Answer: Earlier the Computers were made with Vacuum Tubes, so the size of computers was very big. But now a days VLSI (Very Large-Scale Integration) circuit chips are used in computer; due to these invention computers are very compact in size. **Vacuum Tubes-> Transistors-> ICs -> LSI->VLSI** **Remember:** ICs : Integrated Circuit Chips LSI: Large Scale Integrated Circuit Chips VLSI: Very Large Scale Integrated Circuit Chips
5	Write the use of printer based on its function in a computer system.
	Answer: A printer is an output device because it produces hard copies of digital documents.
6	Differentiate between an operating system used in mobile devices and one used in computers.
	Answer: Android is a mobile OS designed for touchscreen interfaces, while Windows is a computer OS supporting multitasking on desktops and laptops.
7	Explain the impact of John von Neumann's concept on modern computing.
	Answer: He introduced the stored-program concept, enabling programs to be stored in memory, forming the foundation of modern computer architecture.
8	cuss how the Control Unit contributes to the execution of instructions within the CPU.
	Answer: The Control Unit (CU) directs the operation of the processor by fetching, decoding, and coordinating instruction execution.
9	Justify the importance of USB in modern computing environments.

	Answer: USB (Universal Serial Bus) standardizes connections for data transfer and peripheral communication, enhancing device compatibility and ease of use.
10	Explain why a bit is considered the smallest unit of memory in a computer system
	Answer: A bit (binary digit) represents the most basic unit of data, holding a value of either 0 or 1, forming the basis for all computing processes.

Short Questions with Answer

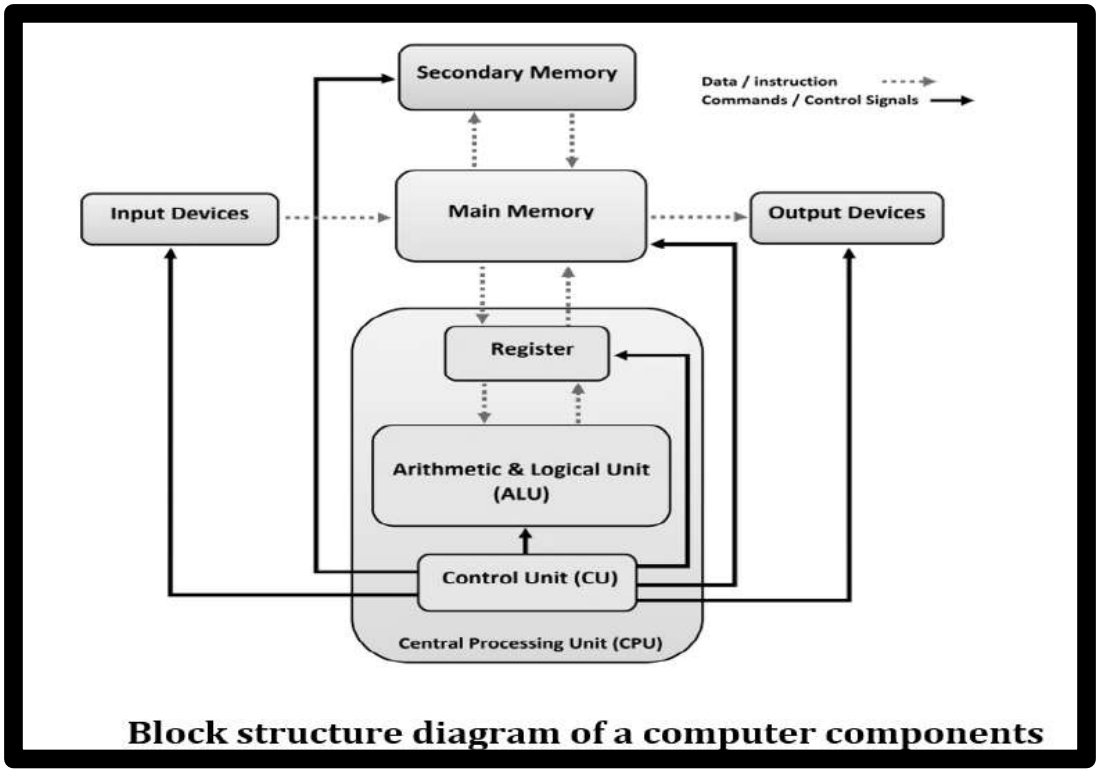
1	Define cache memory and its importance.
	Answer: Cache memory is a small, high-speed memory that stores frequently accessed data to speed up processing. It reduces access time to the main memory.
2	Give any two approaches to recover accidental file deletion.
	Answer: • Enable the Recycle Bin feature to temporarily store deleted files. • Maintain regular backups of important data.
3	Differentiate between primary memory and secondary memory.
	Answer: • **Primary memory (RAM, ROM):** Fast, volatile, used for immediate data processing. • **Secondary memory (HDD, SSD):** Slower, non-volatile, used for long-term storage.
4	List out four differences between RAM and a Hard Disk.
	Answer: • RAM is volatile; a Hard Disk is non-volatile. • RAM is faster; Hard Disks are slower. • RAM stores data temporarily, while the Hard Disk stores data permanently. • RAM has less storage capacity, while Hard Disks have a large storage capacity
5	Give two reasons for data deletion. How can data deletion by unauthorized persons be prevented?
	Answer: • Reasons: Accidental deletion, malware attacks • Prevention: Use strong passwords and allow authorized user to work on the computer or digital device.
6	Give two differences between a compiler and an interpreter.
	Answer: A **compiler** translates the whole program at once; an **interpreter** translates line by line. A **compiler** is faster for execution; an **interpreter** is slower.
7	What is a language translator?
	Answer: A language translator is software that converts high-level programming language code into machine language (binary). Examples: Compiler, Interpreter, Assembler.
8	Name and explain any two types of software.
	Answer: • **System Software:** Manages hardware and system operations (e.g., OS). • **Application Software:** Designed for user tasks (e.g., Microsoft Word).
9	What is firmware? Give an example.

	Answer: Firmware is a type of software embedded into hardware devices to control their functions. **Example: BIOS (Basic Input Output System).**
10	What do you mean by customized software?
	Answer: Customized software is tailor-made software designed for a specific user or organization to meet their unique requirements.

Long Questions with Answer

Q1. Draw the block diagram of a computer system and explain each part briefly.

Answer:



Explanation of Each Component:

- **Input Unit:**
  - Devices like a keyboard, mouse, scanner, and microphone are used to provide data and instructions to the computer.
- **Central Processing Unit (CPU):**
  - Also called the **brain of the computer**, it processes instructions and controls system operations.
  - **Control Unit (CU):** Directs the operations of the processor.
  - **Arithmetic Logic Unit (ALU):** Performs mathematical calculations and logical operations.
- **Memory Unit:**
  - **RAM (Random Access Memory):** Volatile memory that stores data and instructions temporarily.
  - **ROM (Read-Only Memory):** Non-volatile memory that stores firmware and essential booting instructions.
- **Output Unit:**
  - Devices like a monitor, printer, and speakers that display or present the processed data.

- **Storage Unit (Secondary Storage):**
  - Includes Hard Disk Drives (HDD), Solid State Drives (SSD), CDs, DVDs, and USB drives to store data permanently.

Q2. What is hardware? What type of software is required to run hardware devices? Give one example.

Answer:

- **Hardware:**
  - Hardware refers to the physical components of a computer system, including input devices, output devices, memory, and the processor.
  - Examples: Keyboard, Mouse, Monitor, Hard Disk, Printer.
- **Software Required to Run Hardware Devices:**
  - **Device Drivers:** These are specialized programs that allow the operating system to communicate with hardware components.
  - Example: A printer driver is required to make the printer function correctly with a computer.

Q3. Name the memory that is fastest in a computer system. What is the role of such memory, and where is it placed?

Answer:

- **Fastest Memory: Cache Memory**
- **Role of Cache Memory:**
  - Cache memory stores frequently used data and instructions close to the CPU.
  - It reduces the time taken to access data from the main memory (RAM), thereby improving system speed and efficiency.
- **Placement of Cache Memory:**
  - It is located between the **CPU and RAM** or integrated directly inside the **CPU chip**

Q4. What is the purpose of using secondary memory? Give some examples of secondary memory devices. What is the storage capacity of a CD?

Answer:

- **Purpose of Secondary Memory:**
  - Secondary memory is used to store data **permanently** and retrieve it when required.
  - it supports long-term data storage and retains data even when the power is turned off
- **Examples of Secondary Memory Devices:**
  - Hard Disk Drive (HDD) ,Solid State Drive (SSD), Compact Disc (CD)
  - Digital Versatile Disc (DVD), Pen Drive (USB Flash Drive)
- **Storage Capacity of a CD:**
  - A **CD-ROM** (Compact Disc Read-Only Memory) typically has a storage capacity of **700 MB** (Megabytes).

Case-Based Questions and Competency Based Question with Answer

Q1. Rohit bought a computer but noticed it runs very slowly when multiple applications are opened. He asked a technician for advice on upgrading his system.

Give suitable answer of the following:

a) Which component is most likely responsible for multitasking performance?
   - RAM, Hard Disk, Processor, Motherboard

b) What is the role of RAM in computer performance?

c) If upgrading RAM is not an option, suggest one other way to improve the system's speed.
d) Rohit also wants to increase storage capacity. Which type of storage device should he choose for faster performance: HDD or SSD? Why?
e) What utility software can help optimize system performance?

Answer:

a) The component most responsible for multitasking performance is: **RAM**

b) Role of RAM in computer performance:
RAM (Random Access Memory) temporarily stores data that the CPU needs while running applications. More RAM allows smoother multitasking and faster performance.

c) **Alternative way to improve system speed if upgrading RAM is not an option:**
Use an SSD (Solid State Drive) instead of an HDD to speed up data access and system performance.

d) **Best storage device for faster performance:**
SSD (Solid State Drive) is better than HDD because it has faster read/write speeds, reducing loading times and improving overall system responsiveness.

e) **Utility software for optimizing system performance:**
- Disk Cleanup (removes unnecessary files), Disk Defragmenter (for HDDs)
- Task Manager (to manage background processes)
- Antivirus software (to remove malware that slows down the system)

Q2. Computers have transformed our lives, bringing both advantages and challenges. Analyze the following aspects and state whether they have a positive or negative impact:

Give suitable answer the following:

a) **Automation of jobs** – Does it create employment opportunities or reduce them?
b) **Health concerns** – How does prolonged computer usage affect health?
c) **Social networking** – Has it improved communication or caused social isolation?
d) **Accuracy of calculations** – Does using computers in financial transactions reduce errors?
e) **Cybersecurity issues** – How has increased digitization affected data security?

Answer:

Impact of Computers on Society:

a) **Automation of jobs**: Negative impact: It reduces employment in traditional sectors by replacing manual labor with machines. However, it creates new jobs in tech-related fields.
b) **Health concerns**: Negative impact: Prolonged computer usage can cause eye strain, back pain, and carpal tunnel syndrome.
c) **Social networking:** Both positive and negative: It improves communication but can also lead to social isolation if people spend too much time online instead of engaging in face-to-face interactions.
d) **Accuracy of calculations:** Positive impact: Computers reduce human errors in financial transactions, ensuring higher accuracy and reliability.
e) **Cybersecurity issues:** Negative impact: Increased digitization has led to cyber threats like hacking, phishing, and data breaches.

Q3. Neha was working on an important project but forgot to save her work. Unfortunately, her system crashed due to power failure.

Give suitable Answer of the following:

a) Will she be able to recover the unsaved data? Why or why not?
b) Which type of memory is responsible for temporary storage, and why is it lost after shutdown?
c) Suggest one precaution Neha can take in the future to avoid data loss.

d) Name a hardware device that can help prevent unexpected shutdowns.
e) Between an external hard disk and a USB pen drive, which is better for long-term data storage, and why?

Answer:

Neha's Data Loss Due to Power Failure

a) She **can recover unsaved data** it depends on some software (like MS Word) has an auto-recovery feature. But if the data wasn't auto-saved, it is lost.
b) **Memory is responsible for temporary storage**:
RAM stores temporary data, but it is volatile, meaning data is lost after shutdown.
c) **Precautions to avoid data loss in the future**:
Enable AutoSave in applications or manually save work frequently.
d) **Hardware device to prevent unexpected shutdowns**:
UPS (Uninterruptible Power Supply) provides backup power during outages.
e) **Better long-term storage device**:
External Hard Disks are better for long-term storage because they offer more capacity and durability than a USB pen drive.

Q4. Arjun is an architect who wants to create digital blueprints for his clients.
Give suitable answer the following:

a) Should he use traditional paper-based drawing or digital design software? Which one is more efficient?
b) If he prefers digital drawing, which input device is best suited for sketching?
c) What type of display device (monitor) would be best for detailed architectural designs?
d) Which software should he use for designing professional architectural blueprints?
e) What kind of printer should he use for high-quality, large-scale prints of his designs?

Answer:
Arjun's Architectural Design Needs

a) **More efficient method for blueprints**:
Digital design software is more efficient as it allows easy modifications, scaling, and 3D modeling.
b) **Best input device for digital sketching**:
Graphics tablet (e.g., Wacom tablet) for precise sketching.
c) **Best monitor for detailed designs**:
4K Ultra HD monitor with high color accuracy and large screen size.
d) **Best software for architectural blueprints**:
AutoCAD, Revit, and SketchUp are widely used in architecture.
e) **Best printer for large-scale prints**:
Plotter printer (suitable for high-quality, large-scale architectural prints).

Q5. Graphics cards play an important role in computer performance.

Give suitable answer the following:

a) What is the primary function of a graphics card?
b) Do all computers require a dedicated graphics card? Why or why not?
c) For which type of applications is a high-performance graphics card necessary?

d) How does a dedicated graphics card differ from an integrated graphics card?
e) If someone is a casual user (watching movies, browsing the web), would they need a dedicated GPU? Why or why not?

Answer:
Graphics Card and Performance

a) **Primary function of a graphics card**:
It processes and renders graphics for gaming, video editing, and visual applications.

b) **Do all computers need a dedicated GPU?**
No, basic tasks (browsing, office work) can be handled by integrated graphics.

c) **Applications that require a high-performance GPU:**
Gaming, 3D rendering, video editing, and AI-based applications.

d) **Difference between dedicated and integrated graphics cards:**
Dedicated GPU: Has its own memory (VRAM) for better performance.
Integrated GPU: Uses system RAM and shares CPU resources.

e) **Do casual users need a dedicated GPU?**
No, integrated graphics are sufficient for watching movies and browsing.

Q6. Mr. Sharma wants to buy a laptop but is confused between two models: one with DOS and the other with pre-installed Windows.

Give correct answer of the following:

1. Why is the laptop with Windows more expensive than the one with DOS?
   a) DOS version is not user-friendly.
   b) DOS version does not support installing other software.
   c) Windows comes pre-installed, and its cost is included in the laptop price.
   d) None of the above.
2. If Mr. Sharma buys the DOS version, what additional software does he need to install first?
   a) Utility software b) Application software
   c) Operating system d) None of the above
3. Mr. Sharma wants to create spreadsheets. Which software should he install?
   a) MS Excel b) MS Word
   c) MS PowerPoint d) All of the above
4. What software should he install to protect his laptop from viruses?
   a) Windows Media Player b) Windows Defender (Antivirus)
   c) MS Office d) None of the above
5. Which software should he install to browse the internet?
   a) Internet Explorer b) Mozilla Firefox
   c) Google Chrome d) All of the above

Answer:
Mr. Sharma's Laptop Purchase Decision

1(c) Windows comes pre-installed, and its cost is included in the laptop price.
2(c) Operating system (like Windows or Linux).
3(a) MS Excel
4(b) Windows Defender (Antivirus)
5(d) All of the above (Internet Explorer, Mozilla Firefox, Google Chrome).

Q7. Rahul frequently uses his personal computer for online banking, shopping, and work-related activities. Recently, he noticed some unusual transactions in his bank account, which made him suspect a security breach.

Give suitable answer of the following:

a) What could be the most likely cause of Rahul's security breach?
- Weak Passwords
- Malware or Key loggers
- Phishing Attacks
- All of the above

b) What precaution should Rahul take to create a strong password? Name two key characteristics of a strong password.

c) Which type of software should Rahul install to protect his computer from viruses and malicious attacks?

d) Rahul frequently connects to public Wi-Fi. What security risk does this pose, and how can he protect himself?

e) Name two online safety practices Rahul should follow to avoid phishing attacks and unauthorized access to his accounts.

Answers:

a) **All of the above** (Weak passwords, malware, and phishing attacks can all lead to security breaches).

b) **Precautions for a strong password:**
- Use a combination of **uppercase, lowercase, numbers, and special characters**
- Avoid using **common words or personal information**

c) **Antivirus and Anti-Malware Software** (e.g., Windows Defender, McAfee, or Norton)

d) **Public Wi-Fi risks:** Hackers can intercept data using **man-in-the-middle attacks**.
Rahul should use a **VPN (Virtual Private Network)** to encrypt his data.

e) **Online safety practices:**
- Avoid clicking on suspicious links or emails from unknown senders
- Enable two-factor authentication (2FA) for online accounts

Q8. A student deleted some files from a computer. Initially, the files were moved to the Recycle Bin. Later, the student emptied the Recycle Bin but still recovered the files using recovery software.

Give suitable answer of the following:

(a) Where do deleted files first go in Windows computers?
(b) Can files be recovered after emptying the Recycle Bin?
(c) Which software is used to restore deleted files?
(d) Why should sensitive files be securely deleted?
(e) Mention one risk of improper data deletion

Answers

(a) Deleted files first go to the Recycle Bin.
(b) Yes, files can still be recovered after emptying the Recycle Bin until the data is overwritten.
(c) Recovery software / Data recovery software is used to restore deleted files.

(d) Sensitive files should be securely deleted to prevent unauthorized access or misuse of data.
(e) One risk of improper data deletion is data theft or privacy leakage.

Q9. A student uses a computer at home for online classes, gaming, drawing, and document preparation. The computer uses Windows operating system and paint software.

Give suitable answer of the following:

a) Which software acts as an interface between user and hardware?
b) Is Paint an application software or system software?
c) Name one general purpose software from the case study.
d) Which type of software controls hardware devices?
e) Why is application software important for users?

Answers:

(a) Operating System (Windows) acts as an interface between user and hardware.
(b) Paint is an Application Software.
(c) One general purpose software from the case study is Paint.
(d) System Software controls hardware devices.
(e) Application software is important because it helps users perform specific tasks such as drawing, gaming, document preparation, and online learning.

Q10. A photographer stores thousands of photos and videos on a computer for editing and future use. The files are very large in size and need to be stored safely for a long time.

Give suitable answer of the following:

(a) Which type of memory is most suitable for storing large files permanently? Why?
(b) A photographer accidentally deletes an important project folder. The files are not in the Recycle Bin. Suggest one possible way to recover the files and one precaution to improve recovery chances.
(c) The photographer keeps all files only on one hard disk. Analyze one major risk and suggest a better storage strategy.
(d) A photographer wants to share selected photos online while keeping private client data secure. Which security measures should be followed?
(e) Why is cache memory important during photo or video editing?

Answers:

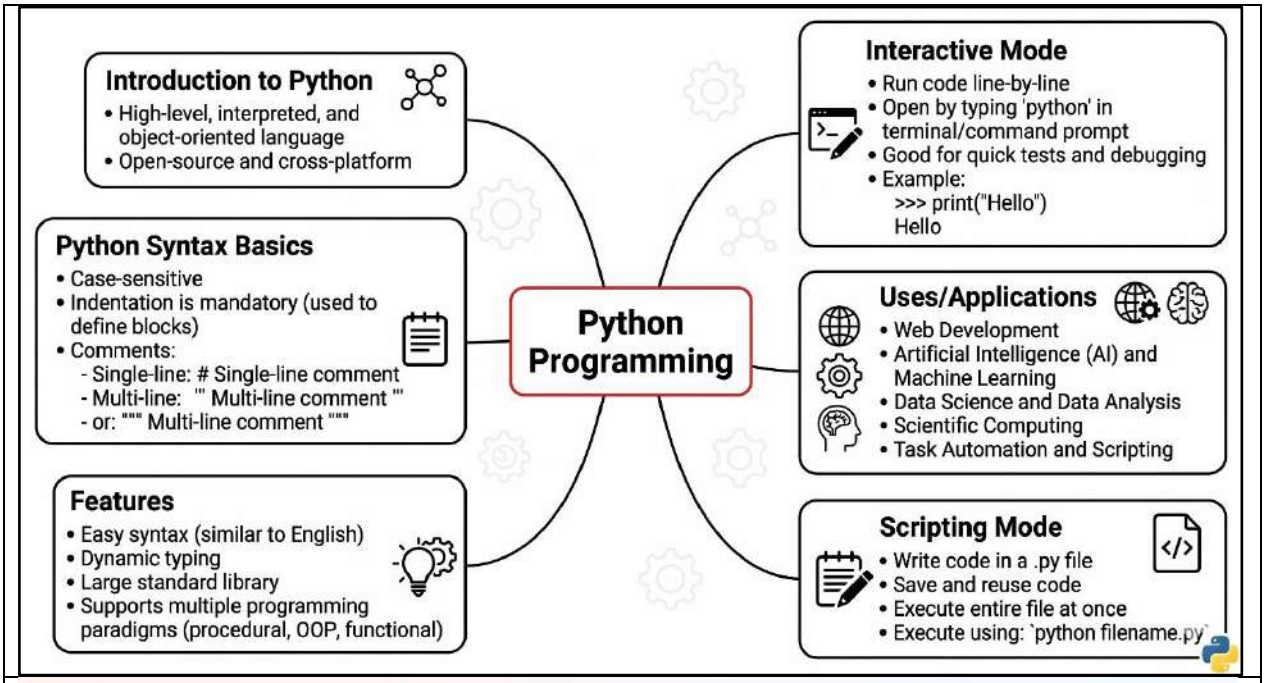
(a)Secondary Memory is most suitable because it can store large amounts of data permanently.
(b) (i) Use data recovery software to recover deleted files.
(ii) Stop using the storage device immediately to avoid overwriting data.
(c) **Risk:** Data loss due to hard disk failure.
Better Strategy:
- Keep backup copies in external storage or cloud storage.
- Use multiple storage devices for safety

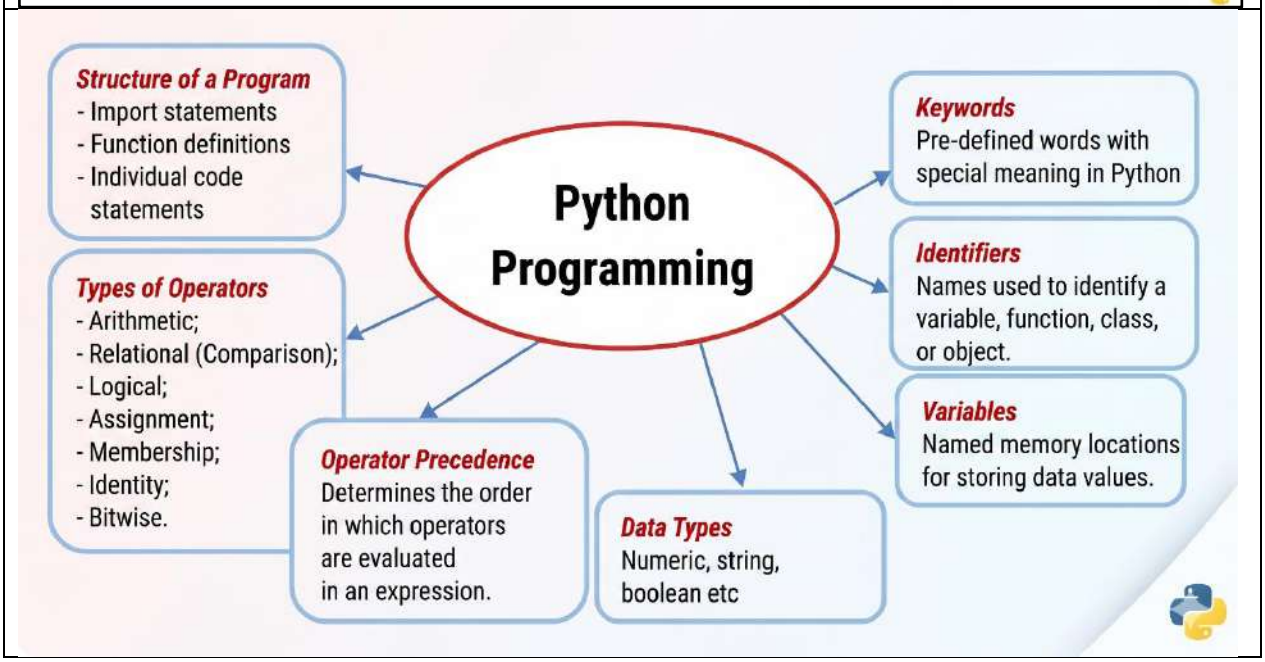
(d) (1) encrypt sensitive files
(2) Use strong passwords
(3) Keep backup regularly
(4) Securely delete unwanted confidential files
(e) Cache memory stores frequently used data temporarily and helps the CPU access data faster, improving editing performance.

UNIT 2: INTRODUCTION TO PYTHON

Basics Of Python

Mind Map





1. Basics of Python Programming :

Python Basics:

Python is a high-level, interpreted, and general-purpose programming language. It emphasizes readability and ease of use, making it a great choice for beginners. It supports multiple programming paradigms, including procedural, object-oriented, and functional programming.

2. Execution Modes:

Python can be run in two primary execution modes:

- **Interactive Mode:**

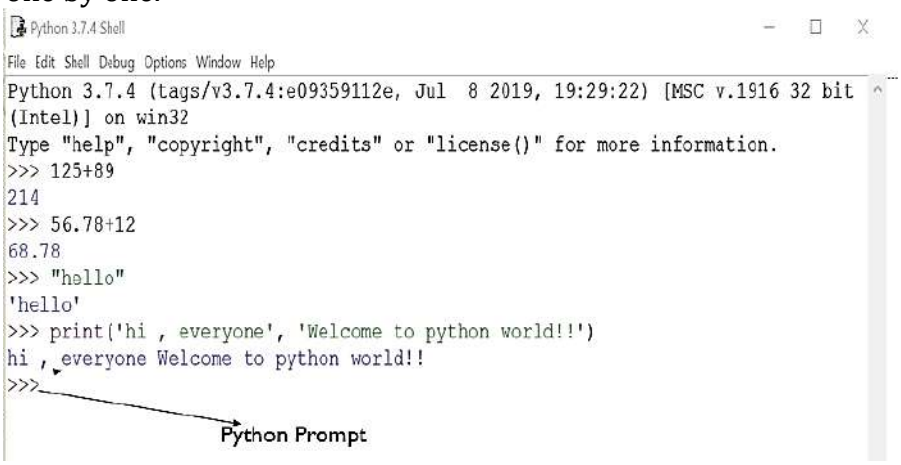
- You enter individual Python commands or expressions, and the interpreter immediately executes and displays the result.
- This mode is great for learning, quick testing and exploring code snippets.
- **Example:** Open the Python shell and type print('Hello, World!') to immediately get the result.

  In Interactive mode, commands are given in front of Python command prompt represented as three greater than signs like >>>

  Example

  ```
  >>> 10+ 15
        25
  >>> print ('Hello, World')
        Hello, World
  ```

  Interactive Mode is **useful for testing small code snippets quickly,** you type the commands, commands are executed one by one and get the result or error one by one.



- **Script Mode:**
  - A Python program is written in a file (.py), which are then executed as a whole by the Python interpreter.
  - This mode is suited for developing larger programs or when you want to run a sequence of Python commands that are stored in a file.

  Steps for writing in Script mode –

  1. Open Python IDLE
  2. From File Menu Choose – New File
  3. Type the codes on File named Untitled
  4. Click on Save from file menu and save file in this format -> filename.py

Interactive Mode Vs Script Mode

In Interactive Mode, the commands or statements entered by the user are not saved. However, in Script Mode, the program code or statements are first saved in a .py file, and then the code is executed.

3. The Structure of a Program

The structure of a Python program typically consists of the following elements:

- **Modules**: Python code is often organized into modules, which are files containing Python definitions and statements.

- **Functions**: Functions are defined using the def keyword and are used to encapsulate code that performs specific tasks.
- **Statements and Expressions**: A statement in Python represents an action (e.g., print ()), while an expression computes a value (e.g., x + y).
- **Control Flow**: Conditional statements (if, else, elif) and loops (for, while) direct the flow of execution.
- **Punctuators (Delimiters):** Symbols used to organize and structure the code.
  Examples: ( ), [ ], { }, :, ,, ., =, @.
  NOTE : Parentheses () can be used to override precedence and force a specific order of evaluation

  A basic program structure may look like this.:

```
print ('hello')
```

A basic program structure using function may look like this:

```
def my_function():                    #defining of function
    # Function code here
    print('hello')
# Main program execution
my_function()                         #calling of function
```

4. Indentation

In Python, indentation is critical and is used to define the structure of code blocks. Unlike many other programming languages, Python does not use braces {} to define blocks of code (like loops or functions). Instead, it uses whitespace indentation.

- **Consistent Indentation**: Python requires consistent indentation throughout a block of code. A common convention is using 4 spaces for each level of indentation.

- **Error if Inconsistent**: If you mix spaces and tabs, or if the indentation is inconsistent, Python will throw an Indentation Error.

Example:

```
if  a==0:
    print('Hello, World!')  # print statement part of if block
print('Hello, World!') # print statement not part of if block
```

5. Identifiers

Identifiers in Python are names used to identify variables, functions, classes, and other objects.

Rules for naming identifiers:

- Must begin with a letter (A-Z or a-z) or an underscore (_).
- Can be followed by letters, digits (0-9), or underscores.
- Case-sensitive: Schoolname, SchoolName, and SCHOOLNAME all three are different identifiers in python.
- Cannot be a keyword (e.g., if, else, def, etc.).

Example: my_variable = 10

Valid Identifiers: Rollno, ROLLNO, ROLL_NO, RNO92A, _RNO, RFILE, true, If

Invalid Identifiers: break(keyword), Roll.No, 19Rno, Roll No, True, if

6. Keywords

Keywords are reserved words in Python that have special meaning and cannot be used as identifiers.

Example: if, else, elif, for, while, def, class, import

7. Constants(Literals)

Values that do not change during execution of program are called constants(literals). In Python, there are no built-in constants (values that cannot be changed once set). However, it's a common convention to use **uppercase letters** for constant-like values, signaling that they should not be changed.

- **Example:** PI = 3.14159 MAX_USERS = 1000

8. Variables

A variable in Python is an identifier whose value can be changed. Python is a **dynamically typed** language, meaning the type of a variable is determined at runtime, based on the value it holds.

- **Declaring Variables**: You don't need to specify the type of the variable; Python automatically assigns the appropriate type based on the value.
  - **Example:**
    - age = 25 # This assigns an integer value to 'age'
    - name = "John" # This assigns a string value to 'name'
- **Reassigning Variables**: Python allows the reassignment of variables to different data types.

```
age = 25                # 'age' contains value of integer type
age = "twenty-five"     # now 'age' contains value of string type
```

9. Types of Operators

Python supports various types of operators to perform operations on variables and values:

- **Arithmetic Operators (**+, -, *, /, //, %, **): Used for mathematical calculations.

Operator	Description	Example X=10, y=20
+ Addition	Adds values on either side of the operator.	>>>X + y >>>30
- Subtraction	Subtracts the right-hand operand from the left-hand operand.	>>>X – y >>>-10
* Multiplication	Multiplies values on either side of the operator	>>>X * y >>>200
/ Division	Divides the left-hand operand by the right-hand operand and always returns a float data type.	>>>X / y >>>0.5
// Floor Division	The division of operands where the result is the quotient in which the digits after the decimal point are removed. But if one of the operands is negative, the result is floored, i.e., rounded away from zero (towards negative infinity) –	>>>9//2 >>>4 ---------- >>>9.0//2 >>>4.0
% Modulus	Divides left hand operand by right hand operand and returns remainder	>>>X % y >>>10
** Exponent	Performs exponential (power) calculation on operators. a ** b means a raised to the power b.	>>>X**2 >>>100

X variable in Capital letter and y variable in small letter

Note: Python is case sensitive This means that uppercase and lowercase letters are treated differently

Note: + and * operators are also used in Sequence Manipulation for concatenation and repetition respectively.

for e.g. X= 'Welcome' Y='2025'

```
>>>X+Y
>>>Welcome2025
```

X='Welcome' Y=2

```
>>>X*Y
>>>WelcomeWelcome
```

- **Relational Operators (**==, !=, >, <, >=, <=**)**: Used to compare two values.It either returns True or False according to the given condition.

Operator	Description	Example X=20, y=10
==	If values of two operands are equal, then returns True otherwise False.	>>> (X == y) >>> **False**
!=	If values of two operands are not equal, then returns True otherwise False.	>>> (X != y) >>> **True**
>	If the value of left operand is greater than the value of right operand, then returns True otherwise False.	>>> (X> y) >>> **True**
<	If the value of left operand is less than the value of right operand, then returns True otherwise False.	>>> (X < y) >>> **False**
>=	If the value of left operand is greater than or equal to the value of right operand, then returns True otherwise False.	>>> (X >= y) >>> **True**
<=	If the value of left operand is less than or equal to the value of right operand, then returns True otherwise False.	>>> (X <= y) >>> **False**

Note: These operators can also be used for comparing string values. Python compares strings lexicographically (alphabetical order used in English dictionary) using Unicode values of characters. Unicode value of uppercase letters A=65, B=66 and so on till Z=90 and that of lowercase letters a=97, b=98 and so on till z=122 and for digits Unicode for 0 to 9 is 48 to 57.

e.g.
```
>>> X= 'ABc'
>>> Y= 'Abc'
>>> X>Y      # evaluates to False
```

- **Assignment Operators (**=, +=, -=, *=, /=,%=,**=,//=**)**: Used to assign values to variables. It evaluates right hand side expression and then assigns to identifier on the left hand side of the operator.

Operator	Description	Example
=	Assigns values from right side operands to left side operand	Z = X + Y assigns value of X + Y to Z

+=	It adds right operand to the left operand and assigns the result to left operand	X += Y is equivalent to X = X + Y
-=	It subtracts right operand from the left operand and assigns the result to left operand	X -= Y is equivalent to X = X – Y
*=	It multiplies right operand with the left operand and assigns the result to left operand	X *= Y is equivalent to X = X * Y
/=	It divides left operand with the right operand and assigns the result to left operand	Y /= Z is equivalent to Y = Y / Z
%=	It takes modulus using two operands and assigns the result to left operand	m %=n is equivalent to m = m % n
**=	Performs exponential (power) calculation on operators and assigns value to the left operand	C **= a is equivalent to C = C ** a
//=	It performs floor division on operators and assigns value to the left operand	c //= A is equivalent to c = c // A

• **Logical Operators (and, or, not)**: Used to combine conditional statements.

Operator	Description	Example X=20, Y=10 Z=5
And	Logical AND: returns True if both the operands are True otherwise False	X>Y and Y>Z **True**
Or	Logical OR: returns True if either of the operands is True otherwise False	X>Y or Y<Z **True**
Not	Logical NOT: returns True if operand is False and vice versa	not (X>Y) **False** not(X>Y and Y>Z) **False**

- **Membership Operators (in, not in):** Used to test membership of an item in a sequence such as strings, lists, or tuples. There are two membership operators as explained below –

```
str= 'KVS 2025 Class IP'
Val='IP' in str
print(Val)
#output : True
```

Operator	Description	Example
in	Evaluates to True if it finds the left-hand operand in the right-hand sequence and False otherwise.	x **in** y, here it results in **True** only if x is a member of sequence y.
not in	Evaluates to True if it does not find the left-hand operand in the right-hand sequence and False otherwise.	x **not in** y, here it results in **True** if x is not a member of sequence y.

- **Identity Operators (is, is not):** Used to compare the memory location of two objects. **is, is not** are the identity operators both are used to check if two values are located on the same part of the memory. Two variables that are equal does not imply that they are identical.

Operator	Description	Example
is	Evaluates to True if the variables on either side of the operator references to the same object and False otherwise.	x **is** y here it checks, if id(x) equals to id(y) then result is **True**
is not	Evaluates to False if the variables on either side of the operator references to the same object and True otherwise.	x **is not** y here it checks if id(x) is not equal to id(y) then result is **True**

- **Bitwise Operators(**&, |, ^, ~, <<, >>**)**: Used for bit-level operations.

10. Precedence of Operators

The precedence of operators determines the order in which operations are performed in an expression. Operators with higher precedence are evaluated before operators with lower precedence.

Precedence Table : Table of operators in descending order of their precedence.

Sr.No.	Operator	Description	Associativity
1	() **Highest Precedence**	Parentheses	Left to Right
2	**	Exponentiation (raise to the power)	Right to left
3	~ , + , -	Complement, unary plus and minus	Left to Right
4	* , /, % , //	Multiply, divide, modulo and floor division	Left to Right
5	+ ,-	Addition and subtraction	Left to Right
6	>>, <<	Right and left bitwise shift	Left to Right
7	&	Bitwise 'AND'	Left to Right
8	^ , |	Bitwise exclusive `OR' and regular `OR'	Left to Right
9	<= < > >=	Comparison operators	Left to Right
10	== !=	Equality operators	Left to Right
11	= %= /= //= -= += *= **=	Assignment operators	Right to Left
12	not	Logical operator	Left to Right
13	And	Logical operator	Left to Right
14	or	Logical operator	Left to Right

Example:

```
result = 3 + 5 * 2 # Multiplication operator evaluated first
print(result)   # Output: 13
```

To change the order of evaluation, use parentheses.
Operator precedence and associativity of operators decides the order in which parts of an expression are evaluated. Precedence tells us which operators should be evaluated first, while associativity determines the direction (left to right or right to left) in which operators with the same precedence are evaluated.

11. Data Types

Data type identifies the type of data which a variable can hold and the operations that can be performed on those data.
Python supports a variety of built-in data types that can store values:

- **Numeric Types**:
  - int: Integer numbers (e.g., 5, -3).
  - float: Floating-point numbers (e.g., 3.14, -0.001).
- **Sequence Types**:
  - str: Strings (e.g., "Hello", 'Python').
  - list: Ordered, mutable collections (e.g., [1, 2, 3]).
  - tuple: Ordered, immutable collections (e.g., (1, 2, 3)).
- **Mapping Type**:
  - dictionary: Key-value pairs (e.g., {"name": "John", "age": 25}).
- **Boolean Type**:
  - bool: True or False.

12. Mutable and Immutable Data Types

- **Mutable Types**: These are data types/objects content or values of which can be changed after it is created.
  - Examples: list, dict.
  - These objects can be modified in place, so changes to a mutable object will affect all references to that object.
- **Immutable Types**: These are data types content or values of which cannot be changed after it is created.
  - Examples: int, str, tuple.
  - When an immutable object is modified, a new object is created, leaving the original object unchanged.

    Example of Mutability:

    ```
    a = [1, 2, 3]
    b = a
    a.append(4)   # Modifies the original list
    print(b)      # Output: [1, 2, 3, 4]
    print(a)      #Output:  [1, 2, 3, 4]
    print(id(a))  # returns memory location of object
    print(id(a))  # returns memory location of object
    ```

    Both variables **a** and **b** refer to the same memory location.

    Immutable object (string)

    ```
    x = "hello"
    y = x
    x = "world"   # Creates a new string object
    print(y)      # Output: hello (y is unaffected)
    print(x)      # Output: world(x value changed)
    print(id(x))  # gives memory location of object
    print(id(y))  # gives memory location of object
    ```

    both x and y variable having different location in memory

Multiple Choice Questions

1	Which function is used to display output in Python? A) show() B) print() C) display() D) output()
2	Identify the valid relational operator among the following. A) = B) += C) == D) and
3	Which of these is a valid Python identifier? A) 1var B) _var C) var-name D) var name
4	What is the correct way to assign a value to a variable in Python? A) x == 5 B) 5 = x C) x = 5 D) x := 5
5	Which operator is used for exponentiation in Python? A) ^ B) ** C) exp() D) %
6	Predict the output of the following code: print(3**2+55/11*-(-3+3)) A) -39.0 B) 27.0 C) -14.0 D) 9.0

Answer (Multiple Choice Questions)

1	B) print()
2	C) ==
3	B) _var
4	C) x = 5
5	B) **
6	D) 9.0

Assertion and Reasoning Questions

Choose correct option for given Assertion (A) and Reasoning (R)

A. Both A and R are True and R is the correct explanation of A.
B. Both A and R are True but R is not the correct explanation of A.
C. A is True but R is False.
D. A is False but R is True.

1	**Assertion (A) :** List is mutable data type. **Reasoning (R):** In-place change is not possible in list elements.
2	**Assertion (A) :** 1ABC is correct Identifier. **Reasoning (R):** Identifier can't start with digits.
3	**Assertion(A):** Variable names whether in capital or small letters, are treated as different python. **Reasoning(R):** Python is a case sensitive language.

Answers (Assertion and Reasoning Questions)

1	C) A is True but R is False
2	D) A is False but R is True
3	A) Both A and R are True and R is the correct explanation of A.

Very Short Questions with Answer

1	What is the None keyword in Python, and what does it represent?
	Ans. None is a special keyword in Python representing the absence of a value or a null value. It is often used to signify that a variable does not have any value assigned to it yet.

2	What is a variable in Python, and how is it different from a constant?
	Ans. A variable is a name that refers to a value that can be changed during the execution of the program, while a constant represents a value that remains unchanged throughout the program.
3	Differentiate between Keywords and Literals (Constants).
	Ans. Python **Keywords** are predefined reserved words in Python that holds special meaning for the Python interpreter. **Identifier** is a user-defined name given to a variable, function, class, module, etc. The identifier is a combination of characters, digits and an underscore. They are case-sensitive i.e., 'num' and 'Num' and 'NUM' are three different identifiers in python. It is a good programming practice to give meaningful names to identifiers to make the code understandable.
4	Arrange the precedence of operators from highest to lowest + , ** , // , ==
	Ans. precedence of operators from highest to lowest **, //, +, ==

Short Questions with Answer

1	Nitin is trying to find out answers of these questions while finding output of a program. Help him to find out correct answers with reason. (i) What will be output of print(14%4)? (ii) Identify the data type of [3, 10] (iii) What will be output of print('5' + '5') ? (iv) What will be output of print(2**3**2) ?
	Ans. (i) Output will be 2 Because % operator provides remainder after division. (ii) List as it is enclosed with square brackets [ ]. (iii) Output will be '55' Because + operator concatenates both the strings. (iv) Output will be 512, because multiple ** follows right to left associativity
2	Write a program to calculate simple interest.
	Ans: P = int(input("Enter Principal : ")) R = int(input("Enter Rate of Interest : ")) T = int(input("Enter Time in Years : ")) SI = (P*R*T)/100 print("Simple Interest = ",SI)
3	Write a Python program to find the average of three numbers where value of a is 10, b is 20 and c is 30.

	Ans:
	#To find the average of three numbers
	a = 10
	b = 20
	c=30
	avg = (a+b+c)/3
	print("The average is ",avg)

4	Predict Output – a, b, c = 2, 3, 4 a, b, c = a*a, a*b, a*c print(a, b, c)
	Ans. 4 6 8

5	Predict the Output – a, b, c = 10, 20, 30 p, q, r = c-5, a+3, b-4 print('a, b, c : ', a, b, c, end = '### ') print('p, q, r : ', p, q, r, sep = '$$ ')
	Ans: a, b, c : 10 20 30###p, q, r : $$25$$13$$16
6	Payal is working in a firm and given a task to find the average of two numbers x=7 y=5 print(x+y/2) she is not getting the correct average, give suitable answer and rectify the code
	Ans: x=7 y=5 print((x+y)/2) both x and y should be in parenthesis to increase precedence of addition than division by 2, then she will be able to find correct average

Case Based Question / Competency Based Question

1	Ritika is learning Python data types in her Informatics Practices class. She writes the following program to understand how different data types behave when modified.
	# Program to understand mutable and immutable data types
	list1 = [10, 20, 30]
	tuple1 = (10, 20, 30)
	print("Original List:", list1)
	print("Original Tuple:", tuple1)
	list1[1] = 50
	print("Modified List:", list1)
	tuple1[1] = 50
	Give suitable answer of the following:
	(a) What will be the output after modifying list1?
	(b) Why is list1 called a mutable data type?
	(c) Why will the statement tuple1[1] = 50 generate an error?
	(d) Identify the mutable and immutable data types used in the program.
	(e) Write the type of error generated by the tuple modification statement.
	tuple1[1] = 50
	Answers :
	(a) Modified List: [10, 50, 30]
	(b) **list1** is mutable because its elements can be changed after creation.
	(c) Tuples are immutable data types, so their elements cannot be modified after creation.
	d) Mutable data type: list , Immutable data type: tuple
	e) TypeError

13. Statements

- **Instructions executed by the Python interpreter.**
- **Types of statements:**
  - **Empty statement: –** Statement which does nothing. Used for placeholder in codes. It is as follows:

```
>>> pass
>>>
```

  - **Simple statement:** Any single executable statement is a simple statement.

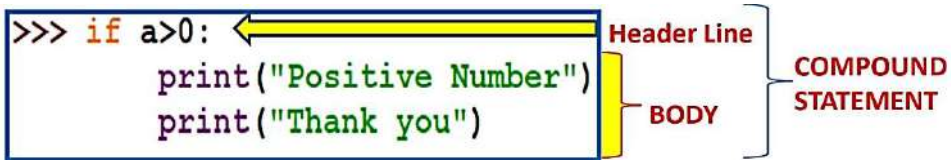
```
>>> a=10+20
>>> print(a)
```

  - **Compound statement:** A group of statements executed as a unit is a compound statement.

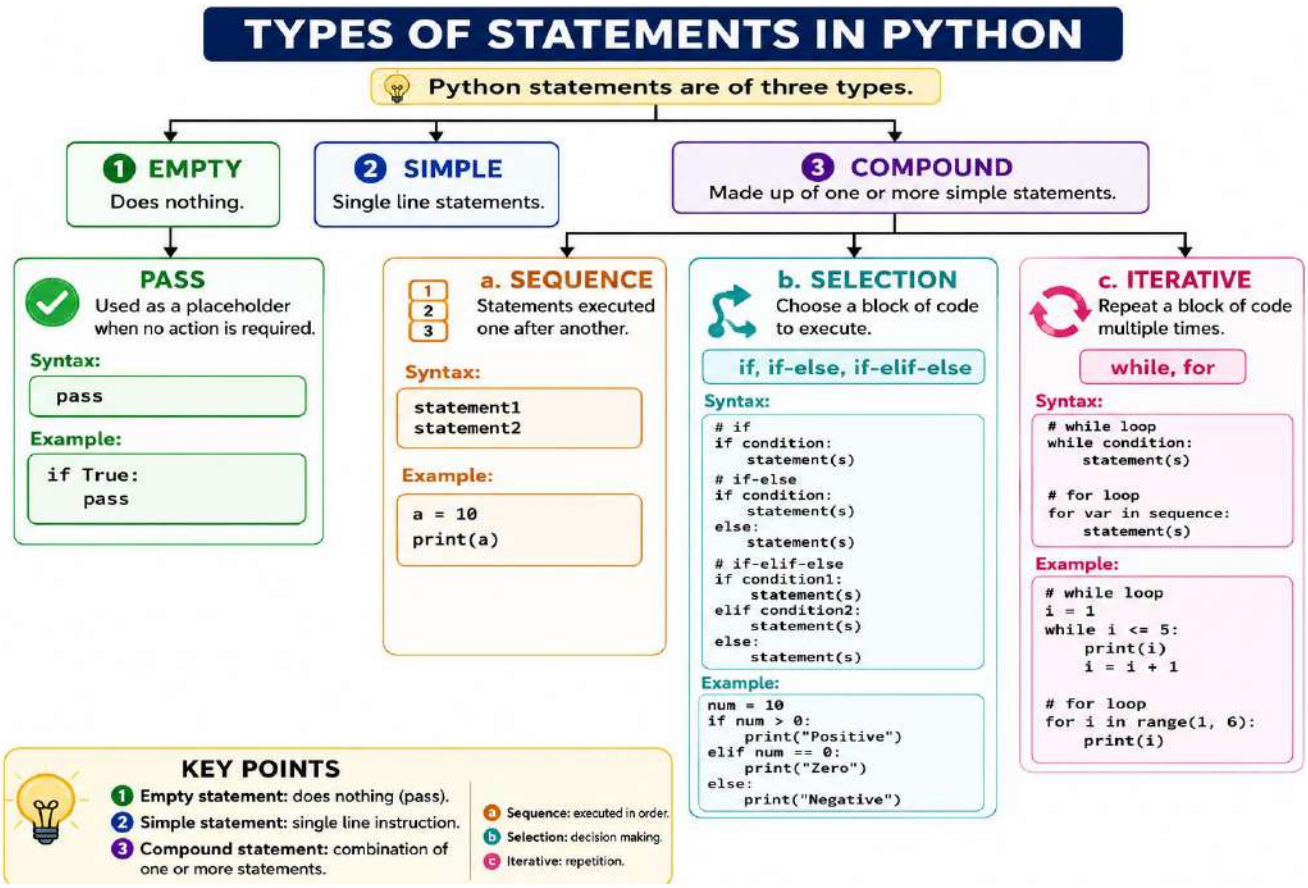
A compound statement has:

(i) a header line which begins with a keyword and ends with a colon.

(ii) a block/body consisting of one or more Python statements, each indented inside the header line. All the statements are at the same level of indentation.



Mind Map



14.Expressions and Evaluation

- Valid combination of variables, operators, and values that yield a result.
- Examples:
  - Arithmetic expressions: e.g. a=2 + 3
  - Logical expressions: e.g. a and b , a or b
  - String expressions: e.g. "Computer" **+** "Science"
- Can be part of a larger statement

Evaluation

- The process of computing the result of an expression.
- Python evaluates expressions using the rules of precedence and associativity.

15. Comments

- Used to annotate code and make it more understandable.
  - **Single-line comments**: Begin with # symbol
    e.g., **#This is a comment.**
  - **Multi-line comments:** Enclosed in triple quotes
    e.g. **""" Multi-line comment**
    To give more description of code """

If the comment is more than one line then multi-line comment can be used.

16. Input and Output Statements

- **Input:**
  - input (): Reads a line of text input from the user
  - (e.g., name = input ("Enter your name: ")).
  - Always returns a string.
- **Output:**
  - print (): Outputs text or values of variables/expressions to the console (e.g., print ("Hello, World!")).
  - Can accept multiple arguments separated by commas (e.g., print ("Name:", name)).
  - Optional arguments like **sep** and **end** can be used to customize the output
    e.g., print ("Hello", "World", **sep**="-")

17. Data Type Conversion

Converting one data type to another.

- <u>Two types:</u>
  - **<u>Implicit Data type conversion</u>** - takes place automatically by type promotion to higher data type.
    E.g. 5 + 2.5 => 5.0 (promoted to float) + 2.5 [int + float => float + float]
  - **<u>Explicit data type conversion</u>**
    Done forcefully/explicitly by the programmer. Some examples are as follows :
- **Common functions:**
  - int(): Converts a value to an integer (e.g., int("42") result is 42)
  - float(): Converts a value to a float (e.g., float("3") result is 3.0)
  - str(): Converts a value to a string (e.g., str(42) result is "42")
  - list(): Converts a value to a list (e.g., list("abc") result is ['a', 'b', 'c'])
  - tuple(): Converts a value to a tuple (e.g., tuple([1, 2, 3]) result is (1,2,3))

- dict(): Converts a value to a dictionary (when applicable, e.g., dict([('a', 1), ('b', 2)]) result is {'a':1 , 'b':2})

18. Debugging in Python

- **Definition:**
  - The process of finding and fixing errors or bugs in program code.
- **Common Debugging Techniques:**
  - print Statements: Insert **print ()** statements in your code to check values of variables and program flow

e.g.

```
print ("Checkpoint reached")   #output     Checkpoint reached
x=15
print ("Value of x:", x)       #output     Value of x: 15
```

19. Control Statements in Python

- **Sequence**: Sequence construct means statement are executed Sequentially:
- **Selection:** The Selection construct means the execution of statement(s) depending upon a condition-test.
- **Iterative:** Iteration construct means repetition of set of statements depending upon a condition test till the time of condition is True.

Understand concept of sequence, selection, iterative statement using real life example:
A child wants to celebrate his birthday. His mother gives him 3 options to decorate the house with least cost. She said decorate the house either with balloon or flower or pictures. If child wants to decorate his house with balloons, then he has to inflate all the balloons one by one until 50 balloons are inflated with the help of the pump.

Real life steps as per the above the example:

1. Child seated with mother to discuss about decoration of house for celebrating his birthday
2. They discuss all 3 options to decorate the house with balloon or flower or pictures **(sequentially child think about every option with its cost)**
3. child think about all options and choose one option (he selects decoration of house with balloons) due to least cost. **Selection statement use of [if/ elif /else]**
4. Child start inflating balloons one by one until 50 balloons are inflated with the help of pump. (Repetition of task; inflation of balloon -> **iteration statement use of [for/ while]**

Note: Students may use this real-life example to design Python programs based on control statements

<u>Selection Statements</u>

- **if statement:**
  - Executes a block of code if a condition is True.
  - Example:

```
A=30
B=20
if (A>B):
  print(" A is greater than B")
```

- **if-else statement:**
  - Executes one block of code if a condition is True, and another block if it is False.

- Example:

```
n=int(input('Enter a number'))
if n%2==0:
    print('EVEN number')
else:
    print('ODD number')
```

- **if-elif-else Statement:**
  - Checks multiple conditions in sequence, executing the first block of code where the condition is true.
  - Example:

```
n=int(input("Enter a no."))
if n>0:
    print("No. is Positive")
elif n<0:
    print("No. is Negative")
else:
    print("It is a zero")
```

<u>Iterative Statements</u>

- **<u>While Loop:</u>**
  - Repeats a block of code as long as a condition is True.

  Example:

```
i=1
while i<=10:
    print(i,end=' ')
    i=i+1
```

- **For Loop**
  - Iterates over a sequence (e.g., list, tuple, string) or range of numbers.

    Syntax: for <variable> in <sequence>
    statements_ to_repeat
  - Example:

```
for i in range(10):
    print(i,end=' ')
```

- **Jump statements**

  Python offers two types of jump statements to be used within loops to jump out of loop iterations.
  - **break**

    break statement is a jump statement which terminates the very loop it lies within and skips over a part of the code(i.e. rest of the loop) and jumps over to the statement following the loop.
  - **continue**

    continue is a jump statement which forces the next iteration of the loop to take place and skip the rest of the statements of current iteration.

<u>Looping with *break* and *continue*:</u>

- **break**: Exit the loop when the **break** statement will encounter.
- **continue**: Skip the rest of the code after **continue** and move to the next iteration.

Examples:

```
for i in range(5):
  if i == 3:
    break
  print(i)
```

```
for i in range(5):
  if i == 3:
    continue
  print(i)
```

Example of **break**: In this case value will not be printed after 2 ,
Example of continue: in this case all the values will be printed as per the condition except 3
Same concept is applicable on **while** loop.

Loop with *else* statement

The **else** statement of a Python loop executes when the loop terminates normally, i.e., when test condition results into False for a while loop or for loop has executed for the last value in the sequence; and not when the **break** statement terminates the loop.

Multiple Choice Questions

1.	What will be the output of the following code? print (type (3.0)) a) <class 'int'> b) <class 'float'> c) <class 'double'> d) <class 'decimal'>
2.	What is the primary purpose of the if statement in Python? a) To execute a block of code based on a condition b) To perform mathematical operations c) To repeat a block of code d) To define a function
3.	Ravi is a student of class xi computer science and he is not able to understand the concept of **if** statement of Python and you as a programmer help him to find out the correct output of the following code snippet? x = 10 if x > 5: print("x is greater than 5") a) x is greater than 5 b) x is less than 5 c) x is equal to 5 d) No output
4.	Which keyword is used to execute a block of code if the condition in the **if** statement is False? a) while b) elif c) else d) for
5.	What is the purpose of the **elif** statement in Python? a) To define a loop b) To perform arithmetic operations c) To exit from a loop d) To execute a block of code if the previous conditions are False

6.	Sunita is a student of class xi computer science and he is not able to understand the concept of **if-elif** statement of Python and you as a programmer help him to find out the correct output of the following code snippet?
	x = 5
	if x < 3:
	print ("x is less than 3")
	elif x == 3:
	print ("x is equal to 3")
	else:
	print ("x is greater than 3")
	
	a) x is less than 3 b) x is equal to 3 c) x is greater than 3 d) No output

7.	How can you execute multiple statements under a single if block in Python?

	a) Separate statements with a colon b) Indent the statements to the same level c) Use the and keyword between statements d) Use the elif keyword

8.	You as a programmer of python in a company, Find out the correct output of the following code
	x = 10
	if x < 5:
	print ("x is less than 5")
	elif x > 15:
	print ("x is greater than 15")
	else:
	print ("x is between 5 and 15")
	
	a) x is less than 5 b) x is greater than 15
	c) x is between 5 and 15 d) No output

9.	What is the purpose of the while loop in Python? a) To execute a block of code repeatedly until a condition is False b) To execute a block of code a fixed number of times c) To define a function d) To iterate over items in a sequence
10.	What is the syntax of **while loop** in Python? a) while expression (): b) while expression: c) while expression loop: d) while loop expression:
11.	How can you exit a loop prematurely in Python? a) Using the break statement b) Using the continue statement c) Using the pass statement d) Using the exit statement
12	Meera created a **List** named **fruits** in python and he **want to access each element of a List**. She writes below code but she is not sure whether below code is correct or not. Help her to find the correct output from the given options fruits = ["apple", "banana", "cherry"] for fruit in fruits: print (fruit, end=" ") a) No Output b) ["apple", "banana", "cherry"] c) 0 1 2 d) apple banana cherry
13.	What will the following code snippet print? for i in range (2,-1,-1): print (i, end=' ') a) 0 1 2 b) 1 2 3 c) 2 1 0 d) 3 2 1 0
14.	What is the purpose of the pass statement in Python? a) To exit from a loop prematurely b) To skip the current iteration of a loop c) To execute a block of code if a condition is False d) To do nothing and act as a placeholder
15.	What is the purpose of the else block in a loop in Python?

	a) To execute if the loop encounters an error b) To execute if the loop completes without encountering a break statement c) To execute if the loop encounters a continue statement d) To execute if the loop encounters a pass statement
16.	An empty/null statement in Python is a) go b) pass c) over d) ;

17.	What is the output of the following code?
	x = 10
	if x > 5:
	print("Hello")
	elif x > 8:
	print("Hi")
	else:
	print("Hey")
	a) Hey b) Hi c) Hello d) Hello, Hi

Answer (Multiple Choice Questions)

1	(b) <class 'float'>
2	(a) To execute a block of code based on a condition
3	(a) x is greater than 5
4	(c) else
5	(d)To execute a block of code if the previous conditions are False
6	(c) x is greater than 3
7	(b) Indent the statements to the same level
8	(c) x is between 5 and 15
9	(a) To execute a block of code repeatedly until a condition is False
10	(b) while expression:
11	(a) Using the break statement
12	(d) apple banana cherry
13	(c) 2 1 0
14	(d) To do nothing and act as a placeholder
15	(b) To execute if the loop completes without encountering a break statement
16	(b) pass
17	(c) Hello

Assertion and Reasoning Questions

Choose correct option for given Assertion (A) and Reasoning (R)

a) Both A and R are True and R is the correct explanation of A.

	b) Both A and R are True but R is not the correct explanation of A. c) A is True but R is False. d) A is False but R is True.
1	**Assertion (A):** The conditional flow of control can be defined with the help of if statement. **Reasoning (R)**: if statement executes one or more statements based on the given condition. If the condition evaluates to True, the statement block following the indentation gets executed, otherwise nothing gets executed.
2	**Assertion (A):** break and continue are termed as Jump statements. **Reasoning (R):** Jump statements can only be used with looping constructs but not with conditional constructs.
3	**Assertion (A**): In an if-else statement, the if block is executed when expression evaluates to True whereas else block is executed when expression evaluates to False. **Reasoning (R):** In a conditional construct, else block is mandatory.
4	**Assertion (A):** The data type of a variable is taken according to the type of value assigned to it. **Reasoning (R):** In Python, variables do not need explicit data type declaration before assigning values. This feature is called dynamic typing.

Answer (Assertion and Reasoning Questions)

1	a) Both A and R are True and R is the correct explanation of A.
2	a) Both A and R are True and R is the correct explanation of A.
3	c) A is True but R is False.
4	a) Both A and R are True and R is the correct explanation of A.

Short Questions with Answer

1	What will be the output of the following code? Also give short explanation about execution of loop with continue statement
	`for i in range (1, 6):`
	`  if i == 3:`
	`  continue`
	`  print (i , end=' ')`

	Ans. 1 2 4 5 Explanation: The continue statement skips the rest of the iteration and moves to the next iteration. So, when i equals 3, it skips printing that value but prints all the other values.

2	What will be the output of the following code? Explain, how the code will be executed?
	`for i in range(3):`
	`  for j in range(3):`
	`  print(i + j, end=' ')`
	`  print()`

	Ans. 0 1 2 1 2 3

	2 3 4 Explanation: The outer loop iterates three times, and for each iteration of the outer lo the inner loop also iterates three times. The values of i and j are added together and printed. Each iteration of the outer loop starts a new line.

3	What will be printed by the following code?
	num = 5
	while num > 0:
	print(num)
	num -= 1
	if num == 3:
	break
	else:
	print("Done")

	Ans. 5 4

4	What is the output of the following code?
	x = 10
	if x < 5:
	print("A")
	elif x > 7:
	print("B")
	else:
	print("C")

	Ans. B

5	What will be the output of the following code?
	x = 5
	while x > 0:
	print (x, end=" ")
	x -= 2
	if x == 1:
	break
	else:
	print("Done")

	Ans. 5 3
6	What do you mean by continue and break keywords
	Ans. The break statement terminates the loop containing it. Control of the program flows to the statement immediately after the body of the loop. The continue statement is used to skip the rest of the code of the current iteration only. Loop does not terminate but continues with the next iteration.
7	What is the use of While loop? With suitable example.
	Ans. The while loop in Python is used to repeatedly execute a block of code as long as a given condition remains True. Example: c = 0 while c < 5: print("C:", c) c += 1

8	Find out the Error in the following Code Snippet. Rewrite the code after removing all the errors and underline the corrections made.
	`x= int("Enter value of x:")`
	`for in range [0,10]:`
	`  if x=y`
	`  print("They are equal")`
	`  else:`
	`  Print( "They are unequal")`

	Ans.
	`x= int(input("Enter value of x:"))`
	`for y in range (0,10):`
	`  if x==y:`
	`  print("They are equal")`
	`  else:`
	`  print( "They are unequal")`

Long Questions with Answer

1	Write a program to test whether given number(other than 1 and 0) is prime or not.

	Ans:
	`a=int(input("Enter number: "))`
	`k=0`
	`for i in range(2,a//2+1):`
	`  if(a%i==0):`
	`  k=k+1`
	`if(k<=0):`
	`  print("Number is prime")`
	`else:`
	`  print("Number isn't prime")`

2	Write a program to compute the result when two numbers and one arithmetic operator out of (+, -, *, /) is given by user.

	Ans:
	`a = int(input('Enter 1st number: '))`
	`b = int(input('Enter 2nd number: '))`
	`c = input('Enter the Operator +,-,/,*: ')`
	`print("The result is: ",end='')`
	`if c=='+':`
	`  print(a+b)`
	`elif c=='-':`
	`  print(a-b)`
	`elif c=='/':`
	`  print(a/b)`
	`elif c=='*':`
	`  print(a*b)`
	`else:`
	`  print('Error : Wrong operator')`

3	Write a program to find the sum of first n natural numbers
	Ans:

```
n=int(input("Enter the Limit : "))
s=0
for i in range(1,n+1):
    s=s+i
print("The sum is : ",s)
```

4	Write a program to input a digit from 0 to 9 and print it in words.
	Ans:

```
n = int(input("Enter the Digit from 0 to 9: "))
print("Entered Digit is : ", end='')
# A list where the index naturally matches the digit (e.g., words[0] is "Zero")
words = ["Zero", "One", "Two", "Three", "Four", "Five", "Six", "Seven", "Eight",
"Nine"]
if 0 <= n <= 9:
   print(words[n])
else:
   print("Not a digit")
```

5	Write a program to find the sum of first n odd numbers.
	Ans:

```
n=int(input("Enter the Limit : "))
s=0
for i in range(1,n+1,2):
    s=s+i
print("The sum is : ",s)
```

6	Write a program to calculate the roots of a given quadratic equation. Values for a, b and c will be entered by the user.
	Ans:

```
import math
a=int(input("Enter a "))
b=int(input("Enter b "))
c=int(input("Enter c "))
d=(b*b)-(4*a*c)
if d>=0:
    print("roots are : ")
    x1=-b+math.sqrt(d)/(2*a)
    x2=-b-math.sqrt(d)/(2*a)
    print(" x1 = =",x1)
    print(" x2 = =",x2)
else:
    print("roots are imaginary.")
```

Case Based Questions with Answer

1	Krishna is looking for his dream job but has some restrictions. He loves Delhi and would take a job there if he is paid over Rs.40,000 a month. He hates Chennai and demands at least Rs. 1,00,000 to work there. In any another location he is willing

to work for Rs. 60,000 a month. The following code shows his basic strategy for evaluating a job offer.

```
pay= _________
location= _________
if location == "Mumbai":
    print ("I'll take it!") #Statement 1
elif location == "Chennai":
    if pay < 100000:
        print ("No way") #Statement 2
    else:
        print("I am willing!") #Statement 3
elif location == "Delhi" and pay > 40000:
    print("I am happy to join") #Statement 4
elif pay > 60000:
    print("I accept the offer") #Statement 5
else:
    print("No thanks, I can find something better")#Statement 6
```

On the basis of the above code, choose the right statement which will be executed when different inputs for pay and location are given.

(i) **Input value:** location = 'Chennai', pay = 50000
a) Statement 1 b) Statement 2 c) Statement 3 d) Statement 4
Answer: (b) Statement 2

(ii) **Input value:** location = "Surat", pay = 50000
a) Statement 2 b) Statement 4 c) Statement 5 d) Statement 6
Answer: (d) Statement 6

(iii) **Input value:** location = "Any Other City", pay = 1
a) Statement 1 b) Statement 2 c) Statement 6 d) Statement 4
Answer: (c) Statement 6

(iv) **Input value:** location = "Delhi", pay = 500000
a) Statement 6 b) Statement 5 c) Statement 4 d) Statement 3
Answer: (c) Statement 4

(v) **Input value:** location = "Lucknow", pay = 65000
a) Statement 2 b) Statement 3 c) Statement 4 d) Statement 5
Answer: (d) Statement 5

2 Sanjeev is, a Python Programmer he is trying to write a program of finding leap year if the value of year is given by user
(A year is a leap year if it is divisible by 4, except that years divisible by 100 are not leap years unless they are also divisible by 400.)

Ans:

	year = int (input ("Enter year: "))
	if year % 400 == 0:
	print (year, "is a Leap Year")
	elif year % 100 == 0:
	print (year, "is not a Leap Year")
	elif year % 4 == 0:
	print (year, "is a Leap Year")
	else:
	print (year, "is not a Leap Year")
	OUTPUT:
	Enter year: 1800
	1800 is not a Leap Year

3	Read the following case and answer the questions:
	A school is organizing a mock election. The eligibility to vote is based on the age of the student. The program checks the student's age and prints if the student is eligible to vote or not.
	
	age = int(input("Enter your age: "))
	if age >= 18:
	print("Eligible to vote.")
	else:
	print("Not eligible to vote.")
	
	Questions:
	a) What will be the output if the user inputs 20?
	b) What is the purpose of the int() function in this code?
	c) Modify the code to also print "Please wait until you are 18." if not eligible.
	d) What will happen if the user enters a non-numeric input?
	e) If a student is eligible to vote another message must be displayed on the screen that is "choose a right person" , where will this print statement would be added in the code.

	Answer:
	a) Eligible to vote.
	b) It converts the input string to an integer.
	c)
	age = int(input("Enter your age: "))
	if age >= 18:
	print("Eligible to vote.")
	else:
	print("Not eligible to vote.")
	print("Please wait until you are 18.")
	d) It will raise a ValueError since int() cannot convert non-numeric input.
	e) "choose a right person" line of code will be added in **if block statement**

4	A school uses the following grading system:
	Marks >= 90 → Grade A
	Marks >= 75 and < 90 → Grade B
	Marks >= 50 and < 75 → Grade C
	Marks < 50 → Grade D
	`marks = int(input("Enter your marks: "))`
	`if marks >= 90:`
	`  print("Grade A")`
	`elif marks >= 75:`
	`  print("Grade B")`
	`elif marks >= 50:`
	`  print("Grade C")`
	`else:`
	`  print("Grade D")`
	Questions:
	a) What grade will be displayed for 88 marks?
	b) What is the output if the marks entered are 45?
	c) What will happen if the user enters -10 in the above code.
	d) Modify the code to also check if the marks are within 0 to 100.

	Answers:
	a) Grade B
	b) Grade D
	c) The original code will still run and give **Grade D**, but it should be considered invalid input.
	d)
	`marks = int(input("Enter your marks: "))`
	`if marks < 0 or marks > 100:`
	`  print("Invalid marks.")`
	`elif marks >= 90:`
	`  print("Grade A")`
	`elif marks >= 75:`
	`  print("Grade B")`
	`elif marks >= 50:`
	`  print("Grade C")`
	`else:`
	`  print("Grade D")`

5	A school wants to help students in revise multiplication tables. The following code print the multiplication table of a number:
	`num = int (input ("Enter a number: "))`
	`for i in range (1, 11):`
	`  print (num, "x", i, "=", num * i)`
	
	Questions:
	a) What will be the output for input 5?
	b) How many times will the loop run?
	c) Modify the code to print the table in reverse order (from 10 to 1).
	d) What is the role of range (1, 11)?

	Answers: a) 5 x 1 = 5 5 x 2 = 10 5 x 3 = 15 5 x 4 = 20 5 x 5 = 25 5 x 6 = 30 5 x 7 = 35 5 x 8 = 40 5 x 9 = 45 5 x 10 = 50 b) 10 times. c) for i in range (10, 0, -1): print (num, "x", i, "=", num * i) d) It generates numbers from 1 to 10.

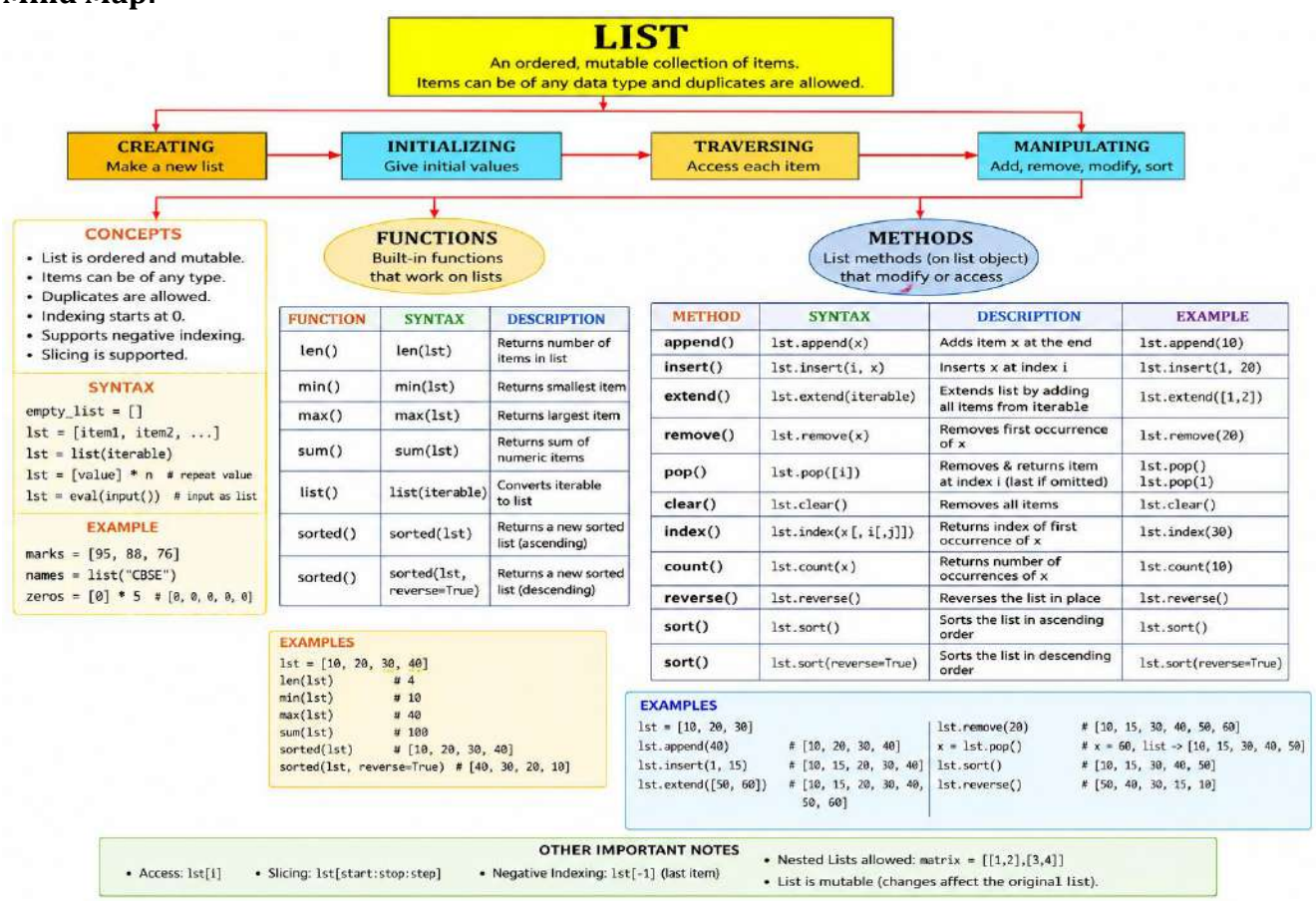
LIST IN PYTHON

List is an ordered sequence which is mutable and made up of one or more elements. A list can have elements of different data types such as integer, float, string, tuple or even another list. Elements of a list are enclosed in square brackets [ ] and are separated by comma. It is a mutable data type.

- **Creating List**
  - We can create a list by placing elements inside square brackets [ ], separated by commas.
    Example : Number=['One', 'Two', 'Three']
  - We can create list using list() method

  data=list() Creates empty list
  data=list([3,4,5])
- **Accessing Elements in a List:** Each element in the list is accessed using its index value (0 to n-1, where n is total number of elements in list).
  - Forward (Positive) Indexing: If accessing of elements start from left to right then the first index value is 0 and second index value is 1 and so on, upto n-1.
  - Backward (Negative) Indexing: If accessing of elements start from right to left then the index value ranges from -1 to –n.
- **Traversing a List**: We can access each element of the list or traverse a list using a loop.
  Example:
  L=[1,2,3,4]
  for item in L:
  print(item)
- **Nested List**: When a list appears as element of another list, it is called a nested list.
  Example: L=[1,2,[3,4],5]

Mind Map:



- **List Methods and Built-in Functions**

There is a key difference between functions and methods in Python. Functions take objects as inputs/parameter. Methods in contrast act on objects.

Function	**Method**
A= [25,36,37,12,25] M=len(A) print(M) #output 5 list named A passed as parameter	A= [25,36,37,12,25] M=A.count(25) print(M) #output 2 count() method acts on object A (list)

Function	**Syntax**	**Description**
list()	list()	If no argument is passed, it will create an empty list.
list()	list(sequence)	It returns a list created from the passed arguments, which should be a sequence type (string, list, tuple etc.). if no argument is passed, it will create an empty list.
len()	len (list)	Returns the length of the list i.e. number of elements in a list
max()	max(list)	Returns the element with the maximum value from the list
min()	min(list)	Returns the element with the minimum value from the list
sum()	sum(list)	It returns sum of elements of the list.
sorted ()	sorted (sequence, reverse=False)	It returns a newly created sorted list; it does not change the passed sequence. By default in sorted() reverse is False

Method	**Syntax**	**Description**
append()	list.append (items)	It adds a single item to the end of the list.
insert()	list.insert (index_no, value)	It adds an element at a specified index
reverse()	list.reverse ()	It reverses the order of the elements in a list
index()	list.index (item)	It returns the index of first matched item from the list.
sort()	list.sort ()	This function sorts the items of the list
count()	list.count (element)	It counts how many times an element has occurred in a list and returns it.
pop()	list.pop (index)/ list.pop()	It removes the element from the specified index and also returns the element which was removed. Default index is -1.
remove()	list.remove (value)	It is used when we know the element to be deleted, not the index of the element.
clear()	list.clear ()	.It removes all the elements from the list.

- **List Methods and Built-in Functions with Examples**

The values that make a list are called its elements, or its items. We will use the term **element** or **item** means same.

Functions	**Examples with output**
list()	X=list() print(X)

	Output: [ ] #emply list created
list(sequence)	Lst=list ("hi") print (Lst) **Output:** **['h', 'i']** **#sequence(String) converted in to list**
len (list)	L= [2, 3, [4,5]] print(len(L)) **Output:** **3** # Explanation: In above example 3rd element is list and it is considered as single element
max(list)	L=[1,-2,4,-4] print(max(L)) **output: 4** **Try it!!!** lst=[[2,3],[4,6],[6,4]] print(max(lst))
min(list)	L=[1,-2,4, -4] print(min(L)) **output: - 4**
sum(list)	L=[1, -2,4, -4] print(sum(L)) **output**: -1
sorted(list,reverse=False)	L=[15,16,17,2,3,9] print(sorted(L)) #by default reverse False **output:** **[2,3,9,15,16,17]** L=[15,16,17,2,3,9] print (sorted (L, reverse=True)) **output:** **[17,16,15,9,3,2]**
list.append(items/ elements)	lst=[3,6,0] lst.append(9) print(lst) **output :** **[3,6,0,9]**
list.insert (index_no, value)	Odd=[1,5,7,9] Odd.insert(1,3) print(Odd) **Output:** **[1,3,5,7,9]** **# value 3 inserted at index position 1**
list.reverse ()	Even=[2,4,6,8] Even.reverse() print(Even) **output:** **[8,6,4,2]**
list.index (item/element)	Even=[2,4,6,8] print(Even.index(4)) **Output:**

	1 #element 4 at index position 1
list.sort ()	Num=[2,4,-6,-8,0] Num.sort() **#by default reverse is False** print(Num) **Output:** **[-8, -6, 0, 2, 4]**
	Num= [2,4, -6, -8,0] Num.sort(reverse= True) print (Num) **Output:** **[4, 2, 0, -6, -8]** Use the "reverse" argument to sort in descending order
list.count (element)	data= [10,30,20,30,90,30] print(data.count(200)) **output:** **0** # element /value 200 not in the list data
	data=[10,30,20,30,90,30] print(data.count(30)) **Output:** **3** # element /value 30 three times in the list data

list.pop (index)	data=[10,30,20,40,50]
	print(data.pop()) # pop() without index position
	print(data)
	Output:
	50 # pop () returns the popped value
	[10,30,20,40]
	# data list printed after popped its last element

	data= [10,30,20,40,50]
	print(data.pop(2)) #pop() function with index position
	print(data)
	Output:
	20 # pop () returns the popped value
	[10,30,40,50]
	# data list printed after popped its element of particular index position.

list.remove (item/element)	data=[10,30,20,25,30,40]
	data.remove(30) #element **30** at index position 1, 4
	print(data)
	output:
	[10, 20, 25, 30, 40]
	# remove the first occurrence of a specified value from the list

list.clear ()	data=[10,30] data.clear() print(data) **output:** **[ ]** # empty list will be displayed after implanting clear method

Multiple Choice Questions

1.	Suppose list1 is [3, 4, 5, 20, 5, 25, 1, 3], what is list1 after execution of list1.pop (1)? a) [3, 4, 5, 20, 5, 25, 1, 3] b) [1, 3, 3, 4, 5, 5, 20, 25] c) [3, 5, 20, 5, 25, 1, 3] d) [1, 3, 4, 5, 20, 5, 25]
2.	Suppose a list mylist is [10,23,45,3,34,50], what is mylist after execution of mylist.remove(3) a) [10, 23, 3, 34, 50] b) [10, 23, 45, 34, 50] c) [10, 23, 3, 34, 50] d) No output
3.	Consider the following code and predict the output mylist = [2,3,8,9,3] mylist.append([2,4]) print(mylist) a) [2, 3, 8, 9, 3, 2, 4, [2, 4]] b) [[2, 4], 2, 3, 8, 9, 3, 2, 4] c) [2, 3, 8, 9, 3, ,2, 4, 2, 4] d) [2, 3, 8, 9, 3, [2, 4]]
4.	Consider a list mylist with n elements, in mylist.pop() what is the default index a) 1 b) 0 c) -1 d) 4
5.	What is the output when we execute? print(list("hello")) a) ['h', 'e', 'l', 'l', 'o'] b) ['hello'] c) will not create a list d) ['h,e,l,l,o']
6.	Which of the following commands will create a list? a) listl = list( ) b) listl = [ ] c) listl = list([1, 2, 3]) d) all of these

Answer (Multiple Choice Questions)

1.	c) [3, 5, 20, 5, 25, 1, 3]
2.	b) [10, 23, 45, 34, 50]
3.	d) [2, 3, 8, 9, 3, [2, 4]]
4.	c) -1
5.	a) ['h', 'e', 'l', 'l', 'o']
6.	d) all of these

Assertion and Reasoning Questions

Choose correct option for given Assertion (A) and Reasoning (R)
a) Both A and R are true, and R is the correct explanation of A.
b) Both A and R are true, but R is not the correct explanation of A.
c) A is true, but R is false.
d) A is false, but R is true.

1.	**Assertion (A):** Lists in Python are mutable. **Reason (R):** We can modify, add, or remove elements from a list after its creation.
2.	**Assertion (A):** A list in Python can contain another list as its element. **Reason (R):** Python does not allow different data types inside a list.

Answer (Assertion and Reasoning Questions)

1	**Answer:** a) Both A and R are true, and R is the correct explanation of A.
2	**Answer:** c) A is true, but R is false.

Short Questions with Answer

1. Write a python code to read a list of numbers and print all even numbers from the list.

Answer:

```
xlist=eval(input("enter elements"))
for i in xlist:
   if i%2==0:
      print(i)
```

Output :

enter elements [1,2,3,8,9]

2

8

2. Write a python code to read a list and replace all even elements with 0 and odd with 1

Answer:

```
xlist=eval(input("enter elements"))
for i in range(len(xlist)):
   if xlist[i]%2==0:
      xlist[i]=0
   else:
      xlist[i]=1
print(xlist)
```

output:

enter elements[2,5,7,98,0,7]

[0, 1, 1, 0, 0, 1]

3. Predict the output of the following code: -

```
Moves=[11, 22, 33, 44]
Queen=Moves
Moves[2]+=22
L=len(Moves)
for i in range (L):
      print ("Now@", Queen[L-i-1], "#", Moves [i])
```

Answer:

Now@ 44 # 11

Now@ 55 # 22

Now@ 22 # 55

Now@ 11 # 44

4. Consider the following list **myList**. What will be the output of the code after executing of below code:

```
myList = [10,20,30,40]
```

```
myList.append([50,60])
d=myList.pop(2)
print(d)
print(myList)
```

Answer:

```
30
[10, 20, 40, [50, 60]]
```

Unsolved Questions (Test your understanding)

1. Read a list and display all elements ends with 5.
2. Read a list and count the occurrence of 5 in the list.
3. Read list and remove last element.
4. Read a list and print all positive numbers from the list
5. Read a list and display elements along with index
6. Write python code to read a list lst and copy all the negative numbers from the list lst to another list lst_neg
7. Read a list and add 2 to all even elements in the list and display the updated list.
8. Write the output of the following code:

```
xylist=[2,3,5,4,56,0,-1]
xylist.pop()
xylist.pop(-1)
xylist.insert(2,4)
print(len(xylist))
print(xylist)
```

9. What will be the output of the following code:

```
list1 = [12,32,65,26,80,10]
list1.sort()
print(list1)
```

10. What will be the output of following code

```
myList = [1,2,3,4,5,6,7,8,9,10]
newlist=[]
for i in range(len(myList)):
    if i%2 == 0:
        newlist.insert(i,myList[i])
print(newlist)
```

Case Based Question with Answer

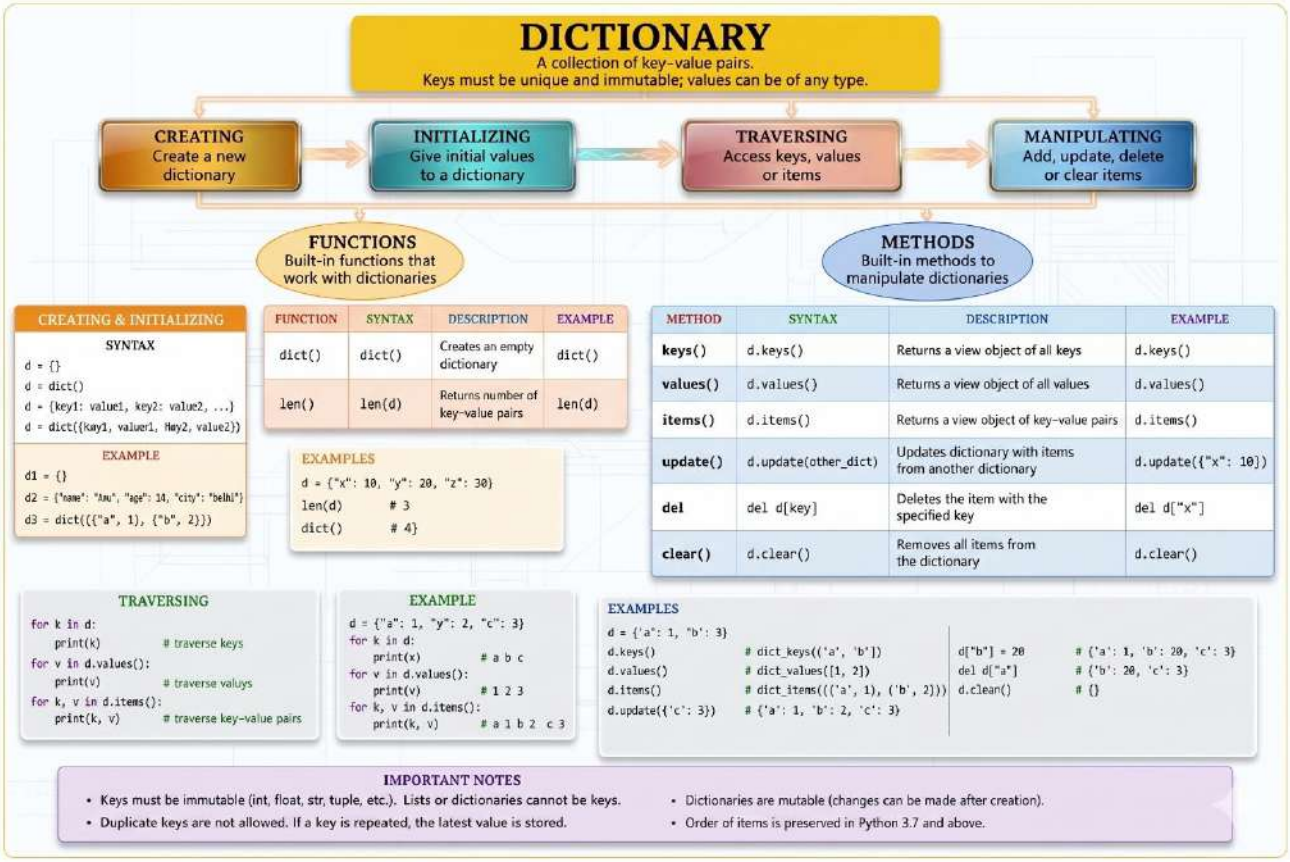
<table>
<tr><td>1</td><td>An e-commerce electronic store tracks its quarterly inventory and sales performance using Python List, which stores the unique codes of the electronic items. The initial data setup is as follows:

items = ["E101", "E102", "E103"]

Questions:
a) Write a Python statement using list operations to display the updated list in descending order.
b) Write a Python statement using list operations to add a new item code "E104" to the end of the items list.</td></tr>
<tr><td></td><td>Answer:
<table>
<tr><th></th><th>Python code</th><th>Output</th></tr>
<tr><td>(a)</td><td>items.sort(reverse= True)</td><td>["E103", "E102", "E101"]</td></tr>
<tr><td>(b)</td><td>items.append("E104")</td><td>["E101", "E102", "E103", "E104"]</td></tr>
</table></td></tr>
<tr><td>2</td><td>The librarian of a school is maintaining a list of newly issued book IDs using Python lists. She wants to perform different operations on the list such as adding new book IDs, removing returned books, counting repeated IDs, and arranging the list properly.
book_ids = [101, 104, 108, 104, 112]
Based on the above case study, answer the following questions:
i. Write the Python statement to add book ID 115 at the end of the list.
ii. Which Python statement should be used to insert book ID 102 at index position 1?
iii. Write the Python statement to remove book ID 108 from the list.
iv. Write the statement using list method to count how many times book ID 104 appears in the list?
v. Write the Python statement to arrange all elements of the list in ascending order.
Answers:
i. book_ids.append(115)
ii. book_ids.insert(1, 102)
iii. book_ids.remove(108)
iv. book_ids.count(104)
v. book_ids.sort()</td></tr>
</table>

DICTIONARY IN PYTHON

Mind Map:



The data type dictionary falls under mapping. It is a mapping between a set of **keys** and a set of **values**. The key-value pair is called an item. A key is separated from its value by a colon (:) and consecutive items are separated by commas. Items in dictionaries are unordered,
A dictionary is an unordered sequence of key-value pairs.

Key and value in a **key-value** pair in a dictionary are separated by a colon. Further, the key: value pairs in a dictionary are separated by commas and are enclosed between curly parentheses.

- The keys of the dictionaries are immutable types such as Integers or Strings etc.
- Indices in a dictionary can be of any **immutable type** and are called **keys**.
- The values of a dictionary in Python are mutable.

- **Creating Dictionaries**

A Dictionary can be created in three different ways:

1. Empty Dictionary using empty { }

D = { } # Empty Dictionary

2. Dictionary using literal notation

D = {"Name": "Mohan", "Class": "XI", "City": "Gurdaspur"}
print(D)

3. Dictionary using dict() function

Dict() function is used to create a new dictionary with no items. For example,

Months = dict() # Creates an empty dictionary

```
print(Month)        # Prints an empty dictionary
```

We can use Square Brackets **[ ]** with keys for accessing and initializing dictionary values.
For Example:

```
Months[0] = 'January'
Months[1] = 'February'
Months[2] = 'March'
print(Months)
```

output: {0 : 'January', 1: 'February' , 2 : 'March'}

```
Months = dict(Jan = 31, Feb = 28, March = 31)
# Creating dictionary by giving values in dict() function
print(Months)
```

output: {'Jan': 31, 'Feb': 28, 'March': 31}

- **Accessing Elements of a Dictionary**

  Elements of Dictionary may be accessed by writing the Dictionary name and key within square brackets ([ ]) as given below:

  ```
  D = {0 : "Sunday", 1 : "Monday", 2: "Tuesday"}
  print(D[1])
  ```

  output: Monday

  ***Attempting to access a key that does not exist, causes an error.

- **Traversing a Dictionary:**

  Dictionary items can be accessed using a for loop.

  ```
  d= {"A": "Apple","B": "Boy", "C":"Cat"}
  for i in d:
     print(d[i])
  ```

  output:

  Apple
  Boy
  Cat

- **Adding an Element in a Dictionary**

  We can add new element (key : value pair) to a dictionary using assignment, but the key being added must not exist in dictionary and must be unique.

  ```
  d["D"]="Dog"          # if a new key is given, new item is added
  print(d)
  ```

  output: {'A': 'Apple', 'B': 'Boy', 'C': 'Cat', **'D': 'Dog'**}

  A new key **'D'** added in to the dictionary **d**

- **Updating / Modifying an element in Dictionary**

  We can change the individual element of dictionary as given below:

  ```
  d["A"]="Android"    # Value of Key ("A") is changed
  print(d)
  ```

  output: {'A': **'Android** ', 'B': 'Boy', 'C': 'Cat', 'D': 'Dog'}

- **Dictionary Methods and Built-in Functions**

Function	Syntax	Description
dict()	dict()	Creates a dictionary from a sequence of key-value pairs
len()	len (dictionary)	function: It is used to find the length of the dictionary, i.e., the count of the key : value pair.
keys()	dictionary.keys()	Returns a list of keys in the dictionary
values()	dictionary.values()	Returns a list of values in the dictionary
items()	dictionary.items()	Returns a list of tuples(key – value) pair
update()	dictionary.update(iterable)	appends the key-value pair of the dictionary passed as the argument to the key-value pair of the given dictionary
del	del Dict_name del dictionary[key]	Deletes the item with the given key or to delete the dictionary from the memory.
clear()	dictionary.clear()	Deletes or clear all the items of the dictionary

Dictionary functions and methods with examples:

Function	Examples	output
dict()	d=dict() print(d)	{}
	dates=dict([['Jan',31], ['Feb',28], ['March',31]]) print(dates)	{'Jan': 31, 'Feb': 28, 'March': 31}
len (dictionary)	dates={'Jan': 31, 'Feb': 28, 'March': 31} print(len(dates))	3
Method	**Examples**	**output**
dictionary.keys()	dates={'Jan': 31, 'Feb': 28, 'March': 31} print(dates.keys())	dict_keys(['Jan', 'Feb', 'March']) **Returns a list containing the dictionary's keys**
dictionary.values( )	dates={'Jan': 31, 'Feb': 28, 'March': 31} print(dates.values())	dict_values([31, 28, 31]) **Returns a list of all the values in the dictionary**
dictionary.items()	dates={'Jan': 31, 'Feb': 28, 'March': 31} print(dates.items())	dict_items([('Jan', 31), ('Feb', 28), ('March', 31)]) **returns a list containing a tuple for each key value pair**
dictionary.update (iterable)	dates={'Jan': 31, 'Feb': 28, 'March': 31} dates.update({'Feb':29}) print(dates)	{'Jan': 31, 'Feb': **29,** 'March': 31}
	dates={'Jan': 31, 'Feb': 28, 'March': 31} dates.update({'April':30})	{'Jan': 31, 'Feb': 28, 'March': 31, 'April': 30}

	print(dates)	**# 'April' Key not exist in dates so new key 'April' added in to the dictionary**
del Dict_name	d={1:"One",2:"Two"} del d print(d)	Removes entire dictionary **#print statement will cause an error because 'd' dictionary no longer exists.**
del dictionary[key]	dates= {'Jan': 31, 'Feb': 28, 'March': 31} print ("Before removal") print(dates) del **dates["March"]** print ("After removal") print(dates)	Before removal {'Jan': 31, 'Feb': 28, 'March': 31} After removal {'Jan': 31, 'Feb': 28} **#will delete particular key from a dictionary**
dictionary. clear()	d={"A":"An","Is":"Are"} d.clear() print(d)	{ } **Removes all the elements from the dictionary**

Note: if single **key:value** pair is to remove from a dictionary then **pop()** and **popitem()** method of dictionary can be used.

- **pop()** method removes and returns a specific item based on a key.
  Syntax: d.pop(key)
- **popitem()** method removes and returns the last inserted key-value pair.
  Syntax: d.**popitem**()

- **Checking existence of a key in a dictionary**

To check if a key is present in the dictionary or not we can use the **in** operator – if the given key is present in the dictionary, it returns True, otherwise it returns False.
e.g.: Consider the dictionary:

dates= {'Jan': 31, 'Feb': 28, 'March': 31}
'Feb' **in** dates # returns **True**
'FEB' **in** dates # returns **False**
'FEB' **not in** dates # returns **True**

Multiple Choice Questions

1	Dictionaries are..... set of elements. a) sorted b) Ordered c) unordered d) random
2	What would the following code print? d= {"Banana": "Yellow", "Orange": "Orange", "Papaya": "Orange"} print(d["Orange"]) a) Yellow b) Orange c) Papaya d) Banana
3	What would the following code print? dates={'Jan': 31, 'Feb': 28, 'March': 31, 'Feb':29} print(len(dates)) a) 1 b) 4 c) 3 d) 0
4	dates={'Jan': 31, 'Feb': 28, 'March': 31, 'feb':29} print(len(dates)) a) 1 b) 4 c) 3 d) 0
5	Which of the following statements create a dictionary? i) d = {} ii) d1 = dict([["john",40],["peter",45]])

	iii) d2 =dict(1,2,4,5) a) Only i b) Only ii c) Both i and ii d) all (i, ii, iii)
6	Which of these about a dictionary is false? a) The values of a dictionary can be accessed using keys b) The keys of a dictionary can be accessed using values c) Dictionaries store data as key : value pair d) Dictionaries are mutable
7	Given the following dictionary Day={1:"Monday", 2: "Tuesday", 3: "Wednesday"} Which statement will be used to delete a value 'Tuesday' a) del Day b) del Day[1] c) del Day[2] d) del Day['Tuesday']
8	Identify the invalid Python statement from the following: a) d = dict() c) f =dict([('Name', 'Sahil')]) b) e = {} d) g= dict{}
9	State True or False : "In Python, Dictionary is a mutable data type".

Answer (Multiple Choice Questions)

1	c) unordered
2	b) Orange
3	c) 3
4	b)4
5	c) Both i and ii
6	b) The keys of a dictionary can be accessed using values
7	b) del Day[2]
8	d) g=dict{}
9	True

Assertion and Reasoning Questions

Choose correct option for given Assertion (A) and Reasoning (R) a) Both A and R are true, and R is the correct explanation of A. b) Both A and R are true, but R is not the correct explanation of A. c) A is true, but R is false. d) A is false, but R is true.	
1.	**Assertion (A):** Dictionaries in Python are mutable. **Reason (R):** Items in a dictionary can be added, removed, or updated after creation.
2.	**Assertion (A):** Dictionaries are enclosed within curly braces { }. **Reason (R):** The key-value pairs are separated by commas (,).

Answer(Assertion and Reasoning Questions)

1	a) Both A and R are true, and R is the correct explanation of A
2	b) Both A and R are true but R is not the correct explanation of A

Short Questions with Answer

1.	Rita is a student of class XI. Help her to create a dictionary to store details of 10 employees given by the user. Each element consists of empcode as key, name and salary as values.
	Answer:
	emp={}
	for i in range(10):
	  l=[]
	  empcode=int(input("enter emplyee code"))
	  name=input("enter name")
	  salary=int(input("enter salary"))
	  l.append(name)
	  l.append(salary)
	  emp[empcode]=l
	print(emp)

2.	Consider the following dictionary and print the name and salary of employees in "computer" department.
	{ "anil":["computer",10000],
	  "anju":["History",5000],
	  "somu":["computer",11000],
	  "sam":["English",8000] }
	Answer:
	data={"anil":["computer",10000], "anju":["History",5000],
	  "somu":["computer",11000], "sam":["English",8000] }
	for key, value in data.items():
	  if value[0]=="computer":
	  print(key , value[1])

Unsolved Questions (Test your understanding)	
1.	The dictionary empdat contains employee records with the following values {1 :["Raj " ,85000], 2: ["Sathya ", 20000], 3: ["Meenu ",89000]} Write a Python program to display only the records where the employee's salary exceeds 75000.

2.	The dictionary students stores students name and their marks:
	students = {
	  "A101": ["Ravi", 88],
	  "A102": ["Divya", 76],
	  "A103": ["Kiran", 95],
	  "A104": ["Neha", 65]}
	Write a Python program to display the name and marks of students who scored more than 80

3.	Write python code to create dictionary to store the following details of 10 products {Productno: [Product name, price, quantity]}
4.	Write the Python statement for the following tasks using built-in functions/methods only: To remove the item whose key is "NISHA" from a dictionary named Students. For example, if the dictionary Students contains { "ANITA":90, "NISHA":76, "ASHA":92) After removal, the dictionary should contain {"ANITA":90, "ASHA":92}

Case Based Question with Answer

1

An e-commerce electronic store tracks its quarterly inventory and sales performance using Python Dictionary, which maps each item code to its current stock count and unit price in INR as [stock, price]. The initial data setup is as follows:

```
# Dictionary mapping item code to [current_stock, unit_price]
inventory = {"E101": [120, 15000], "E102": [85, 45000], "E103": [200, 3500]}
```

Questions:

a) The store wants to check the price of item "E102". Write the expression to extract the unit price (45000) from the inventory dictionary.

b) Write the expression to change the unit price of "E103" to 5000 from the inventory dictionary.

Answer:

	Python code	Output
(a)	print (inventory["E102"][1])	45000
(b)	inventory["E103"][1] =5000 print (inventory["E102"][1])	{"E101": [120, 15000], "E102": [85, 45000], "E103": [200, 5000]}

2

A school is maintaining student records using Python dictionaries. Each student's Roll Number is stored as the key and the student's name is stored as the value. The computer teacher performs different dictionary operations to manage and update the records.

student = {101:"Aman", 102:"Riya", 103:"Kabir"}
Based on the above case study, answer the following questions:

i) Write the Python statement to add a new student with Roll Number 104 and name "Neha".

ii) Write the Python statement to update the name of Roll Number 102 to "Ritika".

iii) Which dictionary method is used to display all the keys of the dictionary? Write the statement for the given dictionary.

iv) a) Write the Python statement to delete the record of Roll Number 103 from the dictionary.
b) Which dictionary method is used to display both keys and values together?Write the statement for the given dictionary.

v) a) Write the Python statement to find the total number of elements present in the dictionary.
b) Write the Python statement to remove all elements from the dictionary.

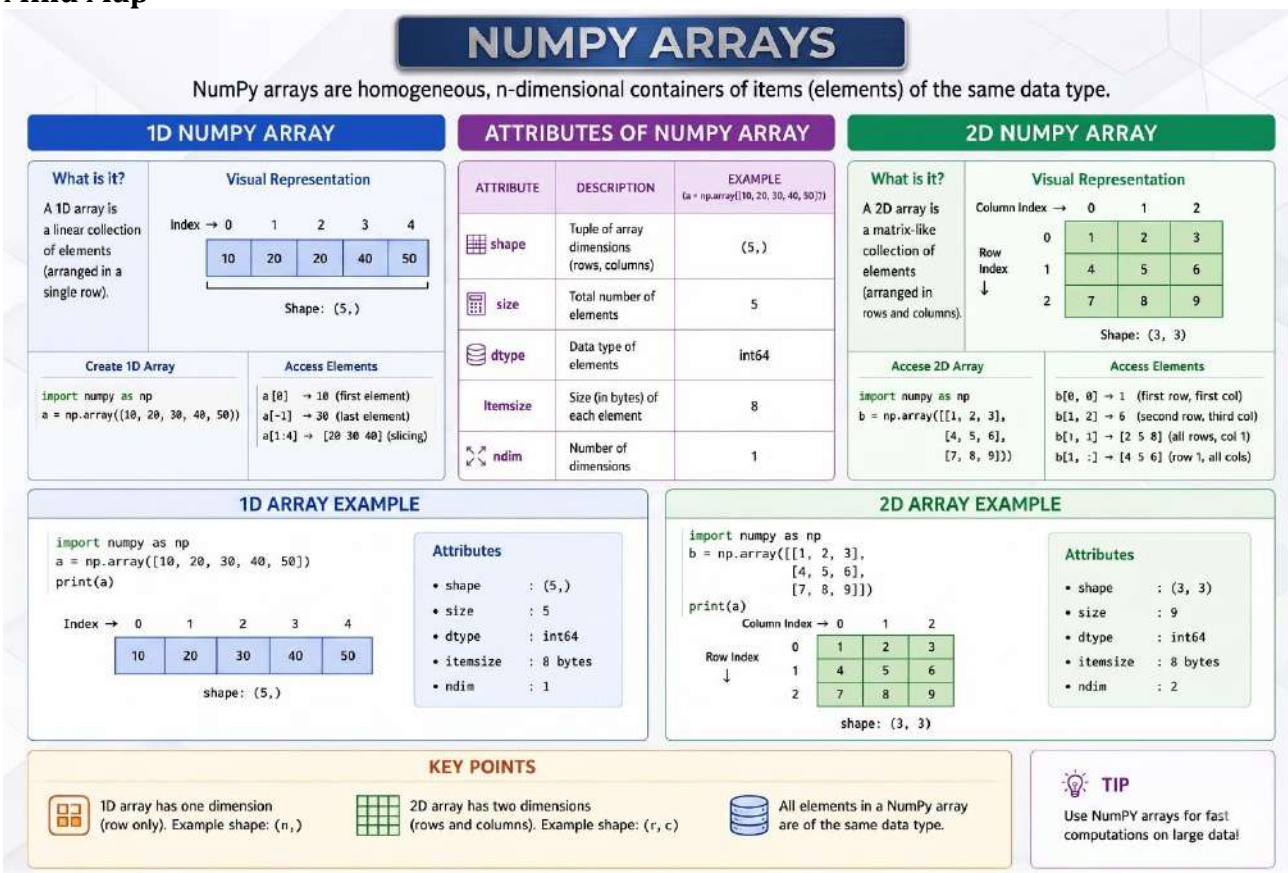
Answers:

i) student[104] = "Neha"
ii) student[102] = "Ritika"
iii) student.keys()
iv) a) del student[103]
b) student.items()
v) a) len(student)
b) student.clear()

INTRODUCTION TO NUMPY

Introduction, Creation of NumPy Arrays from List

Mind Map



- **NumPy (Numerical Python)** is an **open-source python library** for data analysis, specially used for scientific analysis of data with Python. NumPy provides different functions for fast mathematical computation on arrays, matrices and on multi-dimensional arrays.
  To make array using NumPy in Python, need to install a NumPy. NumPy library can be installed using Python packages like pip.
- **To install NumPy in Python, use the pip package on command line and choose the absolute path of location, where python is installed.**

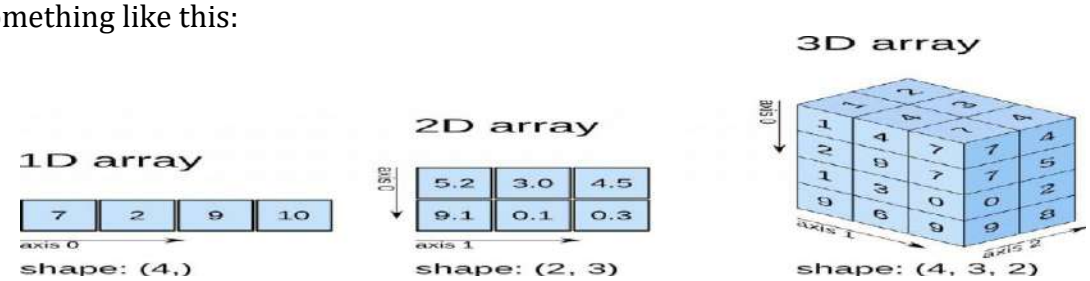
  pip install numpy
- NumPy is a library in Python which can be imported in a program by using import command as

  import numpy as np
- **Array:** Group or collection of similar type of elements.
  Eg. Scores of players in a cricket match, Marks of students in a class
- **NumPy Array:** A grid contains value of same type (homogeneous elements) and uses Zero based indexing, like lists in Python. NumPy Array also known as **ndarray**
- **Difference between List and Array:**
  - Arrays only hold data of same data type, while list can hold the data of mixed data types (like int, float etc)

- Using of Arrays to store data is more memory efficient and help to perform fast calculation and operations.
- List is a part of core python , Array/ndarray is a part of NumPy Library

- NumPy **Arrays** are grid-like structures similar to lists in Python but optimized for numerical operations. NumPy array can be created by converting a regular Python list into an array using the **np.array()** function. This function returns **ndarray** object. **Once the NumPy array is defined, the space it occupies in memory is fixed and cannot be change.**

- **Ndarray** is one of the most important classes in the NumPy python library. It is basically a multidimensional or n-dimensional array of fixed size with homogeneous elements (i.e., the data type of all the elements in the array is the same). A multidimensional array looks something like this:



- **Axes:** Axes are defined for arrays with more than one dimension. A 2-dimensional array has two corresponding axes: the first running vertically downwards across **rows(axis 0),** and the second running horizontally across **columns (axis 1).** Many operations can take place along one of these axes.

- **Rank**: The no. of axes in a **ndarray** is called its rank.

- **Creation of NumPy array using List**
  Example: Python Code

```
import numpy as np
Lvalue=[10,20,30,40,50]
Larray=np.array(Lvalue)
```

- **Types of Arrays:**
  - 1-D Array: A single row of elements.
  - 2-D Array: A matrix with rows and columns

  1) 1D NumPy array creation **->** Using **List:**

```
>>> import numpy as np
>>> List1=[10,50,90,130]
>>> Arr1=np.array(List1)
>>> Arr1
array([ 10,  50,  90, 130])
>>> print(List1)
[10, 50, 90, 130]
>>> print(Arr1)
[ 10  50  90 130]
```

  2) 2D NumPy Array creation -> Using list:

A list of lists i.e. nested list will create a 2D Numpy array, similarly, you can also create N-dimensional arrays.

```
>>> import numpy as np
>>> List2=[[1,2,3],[4,5,6]]
>>> Arr2=np.array(List2)
>>> Arr2
array([[1, 2, 3],
       [4, 5, 6]])
>>> print(List2)
[[1, 2, 3], [4, 5, 6]]
>>> print(Arr2)
[[1 2 3]
 [4 5 6]]
```

- **Attributes of Numpy array:**

SNo.	Attribute	Syntax	Example
1	**Shape**	**<ndarrayname>.shape** A tuple of integers giving the size of the array along each dimension. (no. of element along each axis of the array)	import numpy as np arr = np.array([[1, 2, 3, 4, 5]]) print(arr.shape) **(1,5) # output** import numpy as np arr = np.array([[1, 2, 3, 4, 5], [2,3,4,5,6]]) print(arr. shape) **(2,5) # output**

2	**Size**	**<ndarrayname>.size**
		Total no. of elements in the array
			>>>Arr1=np.array([1,2,3])
			>>> Arr1.size
			3 #output
			>>>Arr2=np.array([[1,2],[3,4],[5,6]])
			>>> Arr2.size
			6 #output

3	**<u>Datatype (dtype):</u>**	**<ndarrayname>.dtype**
		Type of data stored in the array
			>>> Arr3=np.array([1,20,60])
			>>> Arr3.dtype
			int32 / int64
			>>> Arr4=np.array([10.5,25.8,50.7])
			>>> Arr4.dtype
			float64

4	**ItemSize:**	**<ndarrayname>.itemsize**
		Size of each element of ndarray in bytes
			>>> arr1=np.array([10,20])
			>>> arr1.itemsize
			4 (As all elements are int type)
			>>> arr2=np.array([2.5,7.8])
			>>> arr2.itemsize
			8 (As all elements are float type)

<u>5</u>	**ndim**	**<ndarrayname>.ndim**
		It returns an integer representing the number of dimensions.
			import numpy as np
			Arr2=np.array([1,2,3])
			print(Arr2.ndim)
			1 #output
			Arr2=np.array([[1,2,3], [7,8,9]])
			print(Arr2.ndim)
			2 #output

Creating arrays with specific values:

Method	Description	Example

numpy.zeros()	This function creates an array filled with zeros. It requires the shape of the array as a parameter.	>>> a1=np.zeros((2,3))
		>>> a1
		array([[0., 0., 0.],
		[0., 0., 0.]])

		>>> a2=np.zeros((4,))
		>>> a2
		array([0., 0., 0., 0.])

numpy.ones()	This function creates an array filled with ones. It requires the shape of the array as a parameter.	>>> a3=np.ones((2,3))
		
		>>> a3
		array([[1., 1., 1.],
		[1., 1., 1.]])
		>>> a4=np.ones((2,))
		>>> a4
		array([1., 1.])

numpy.arange()	It creates an array of evenly spaced values within a given interval. It is similar to Python's built-in range() function but returns a NumPy array instead of a list. ***numpy.arange([start,]stop, [step,] dtype = None)***	>>> ar=np.arange(5,10)
		>>> ar
		array([5, 6, 7, 8, 9])
		
		>>> ar2=np.arange(5)
		>>> ar2
		array([0, 1, 2, 3, 4])
		
		>>>ar3=np.arange(5.5, 10.5,2,dtype='float64')
		>>> ar3
		array([5.5, 7.5, 9.5])

numpy.full()	Return a new array with the same shape and type as a given array filled with a fill_value. Parameters ***numpy.full(shape, fill_value, dtype = None)***	>>>ar1=np.full((2,2),5,dtype='int')
		>>> ar1
		array([[5, 5],
		[5, 5]])
		>>>ar2=np.full((4,),1.5, dtype='float')
		>>> ar2
		array([1.5, 1.5, 1.5, 1.5])

Multiple Choice Question and Fill in the Blanks

1	What does NumPy stand for? (a) Number Platform (b) Numerical Python (c) Numeric Python (d) Number Picture
2	Array object in NumPy is called _____ (a) number array (b) Narray (c)numpy Array (d)ndarray
3	NumPy is open source in python (True/ False)
4	Follow the below code : arr = np.array([[1, 2, 3,4], [4, 5, 6,7]]) Find out the dimensions it has. (a) 1 (b) 2 (c) 3 (d) 4
5	Fill the blanks in the below python code and underline it. import numpy as _____ Array=np._____([1,2,3,5,6]) print(Array)
6	Which attribute of NumPy array is used to find out the number of dimensions? (a) ndimn (b) ndim (c) ndimensions (d)ndarray
7	When this python code will execute, then which output will come? import numpy as np

	L1=[1,2] L2=[3,4] arr = np.array([L1, L2]) print(arr[1, 0]) (a) 1 (b) 2 (c) 3 (d) 4
8	from the below python code display the value of first element of array and display number 35 from an array import numpy as np Array=np.array([3,6,9,12,15,18,36,35,38]) print(Array[ ],Array[ ]) (a) [1],[7] (b) [1],[8] (c) [0],[8] (d)[0],[7]
9	Find the output of the below code: import numpy as np Array=np.array([3,6,3,3,15,18,36,35,38]) print (Array [:4]) (a) [3 6 3 3] (b) [3,6,3,3,15] (c) [3,6,3,3] (d)[3,15,18,36,35,38]
10	Which of the following is correct way to import the Numpy module in your program? (a) import numpy (b) import numpy as np (c) from numpy import * (d) All of the above
11	What will be the output of following code? import numpy as np A=np.array([24,46,57,14,68,34,89,92]) print(A[7:3:-1]) print(A[2:6]) a) [92 89 34 68] [57 14 68 34] b) [92 34 89 68] [14 57 68 34] c) [92 68 34 89] [14 68 57 34] d) [92 34 68 89] [34 14 68 57]
12	Find out the Correct Statement: (a) Python List occupy less space than a NumPy array. (b) NumPy array can contain elements of non-homogenous type. (c) We cannot change the size of NumPy array after the store in memory (d) All of the above.

Answer (Multiple Choice Question and Fill in the Blanks)

1	(b) Numerical Python
2	(d) ndarray
3	True
4	(b) 2
5	import numpy as **np** Array=np.**array**([1,2,3,5,6]) print(Array)
6	(b)ndim
7	(c) 3 Explanation: arr value will be [[1 2] [3 4]] print(arr[1,0]) To access elements from 2-D arrays we can use comma separated integers representing the dimension and the index of the element.
8	(d) [0],[7]
9	(a) [3 6 3 3]

	Explanation: print (Array [:4]) This statement starts printing element from index position 0 and will print upto index position 4-1=3 as its increment by 1 (default increment).
10	(d) All of the above
11	(a) [92 89 34 68] [57 14 68 34] Explanation: print (A [7:3: -1]) This statement starts printing element from index position 7 and display upto index position (3-(-1))=4 as its decrement by -1
12	(c) We cannot change the size of NumPy array after the store in memory.

Assertion and Reasoning Questions:

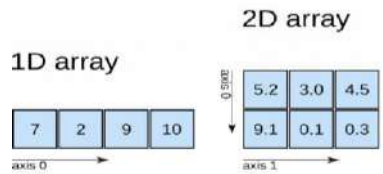
Choose correct option for given Assertion (A) and Reasoning (R) a) Both A and R are true, and R is the correct explanation of A. b) Both A and R are true, but R is not the correct explanation of A. c) A is true, but R is false. d) A is false, but R is true.	
1	**Assertion(A):** NumPy is an open-source numerical python library. NumPy contain a multi-dimensional array and matrix data structure. **Reason(R):** Array contain set of homogeneous values stored under one name. Array can be one dimensional, 2 D or multi-dimensional.
2	**Assertion(A):** in python list values are separated by comma but in NumPy array value are separated by space at the time of display of value. It only used for distinguish purpose. **Reason(R):** both consume same size of memory
3	**Assertion(A):** for creating a list import of NumPy is required and for creating ndarray import NumPy library is not required. **Reason(R):** ndarray cannot be created without importing NumPy but list can be created without importing NumPy library.

Answer (Assertion and Reasoning Questions)

1	(a) Both A and R are true, and R is the correct explanation of A.
2	(b) Both A and R are true, but R is not the correct explanation of A.
3	(d) A is false, but R is true.

Short Questions with Answer

1	What is the difference between Array and List?
	Answer: **Difference between List and Array:** ● Arrays hold data of same data type only, while list can hold the data of mixed data types (like int, float etc) ● Using of Arrays to store data is more memory efficient and help to perform fast calculation and operations. ● List is a part of core python, Array/ndarray is a part of NumPy Library ● List take more space and more time of memory to store the elements because of different data types but Array takes less time and less space of memory to store elements because of same data type of elements of Array
2	How to create an Array of list in python using NumPy? Explain with suitable example.
	Answer:

	NumPy Arrays are grid-like structures similar to lists in Python. NumPy array can be created by converting a regular Python list into an array using the **np.array()** function. import numpy as np List1= [10,50,90,130] Arr1=np.array(List1) print (List1) # will display list [10,50,90,130] print (Arr1) # will display array of list [10 50 90 130]
3	What is an ndarray? What is use of Array in python code?
	Answer: **Ndarray** is one of the most important classes in the NumPy python library. It is basically a multidimensional or n-dimensional array of fixed size with homogeneous elements (i.e., the data type of all the elements in the array is the same) **Example** in this example 1-D array shape size is (1,4) and 2-D array shape size is (2,3) 
4	Write a program to make 1-D array and 2-D array list.
	Answer: **1-D array of list** import numpy as np arr = np.array([1, 2,3, 4]) print(arr) **output:** [1 2 3 4] **2-D array of list** import numpy as np arr = np.array([[1, 2,3, 4], [5,6,7,8]]) print(arr) **output: [**[1 2 3 4] [5 6 7 8]**]**
5	Write down some of the advantages of using NumPy arrays over Python lists?
	Answer: NumPy arrays offer several advantages, including: faster performance for numerical operations due to vectorization, more efficient memory usage, and a wide range of mathematical functions and operations. Array also helpful in Optimize the data that help CPU to perform operation accurately and effectively. NumPy is designed for data analysis and manipulation, offering a wide range of functions for sorting, searching, and statistical analysis.
6	Given a list L=[1,2,3,4] and an ndarray N having elements [1 2 3 4] . What will be the result produced by the following statements? (a) L*2 (b) N*3 (c) L+L (d) N+N
	Ans: (a) [1,2,3,4,1,2,3,4] (b) [3 6 9 12] (c) [1,2,3,4,1,2,3,4] (d) [2 4 6 8]

Case Based Question with Answer

<table>
<tr><td>1</td><td>Consider the following data:
2.5 19 0
3.4 18 7
10.5 19.2 5
(a) Use nested Python lists to create a 2-D array called array1 having 3 rows and 3 columns .
(b) Write python code and find the size of the array1.
(c) Write python code to find the datatype that store the elements in to the memory .
(d) Write python code to find out the shape of the nested list as per the list elements in array 1.</td></tr>
<tr><td></td><td>Answer: (a)
<table>
<tr><th></th><th>Python code</th><th>Output</th></tr>
<tr><td>(a)</td><td>import numpy as np
array1=np.array([[2.5,19,0],[3.4,18,7],[10.5,19.2,5]])
print(array1)</td><td>[[2.5 19. 0.]
[3.4 18. 7.]
[10.5 19.2 5.]]</td></tr>
<tr><td>(b)</td><td>print(array1.size)</td><td>9</td></tr>
<tr><td>(c)</td><td>print(array1.dtype)</td><td>float64</td></tr>
<tr><td>(d)</td><td>print(array1.shape)</td><td>(3, 3)</td></tr>
</table></td></tr>
<tr><td>2</td><td>An e-commerce electronic store tracks its quarterly inventory and sales performance using Python NumPy Array, which Stores a 2D matrix of sales quantities, where rows represent the items and columns represent sales over three consecutive months (Jan, Feb, March). The initial data setup is as follows:
sales_matrix:
Jan Feb March
E101 40 35 50
E102 15 20 12
E103 70 85 90
2D NumPy array for Jan, Feb, March sales quantity and Rows represent E101, E102, E103 respectively
Questions:
a) Write a Python code snippet to calculate and print the total sales quantity achieved in each month using the sales_matrix NumPy array.
b) Write a Python code snippet to calculate and print the total sales quantity achieved by each item in three-month period using the sales_matrix NumPy array.
c) Write the NumPy slicing statement to extract the sales data of the first two items (E101 and E102) for the last two months (February and March).</td></tr>
</table>

Answer:

	Python code	Output
(a)	total_sales_per_item = sales_matrix.sum() print(total_sales_per_item)	[125 140 152] #(axis=0)
(b)	total_sales_per_item = sales_matrix.sum(axis=1) print(total_sales_per_item)	[125 47 245] #(axis=1)
(c)	sub_sales = sales_matrix[0:2, 1:3] print(sub_sales)	[[35 50] [20 12]]

3 A data analyst is working on student marks using NumPy in Python. She first stores the marks in a Python list and then converts the list into a NumPy array for faster processing and mathematical operations.

marks = [78, 85, 90, 67, 88]

Based on the above case study, answer the following questions:

i) Name the Python library used for creating and working with arrays.
ii) Write the Python statement to import NumPy using the alias np.
iii) Write the Python statement to create a NumPy array named arr from the given list marks.
iv) Which function of NumPy is used to create an array from a list?
v) Which of the following is the correct way to create a NumPy array from a list?

1) arr = list(marks) 2) arr = np.array(marks)
3) arr = array.list(marks) 4) arr = numpy.list(marks)

Answers :

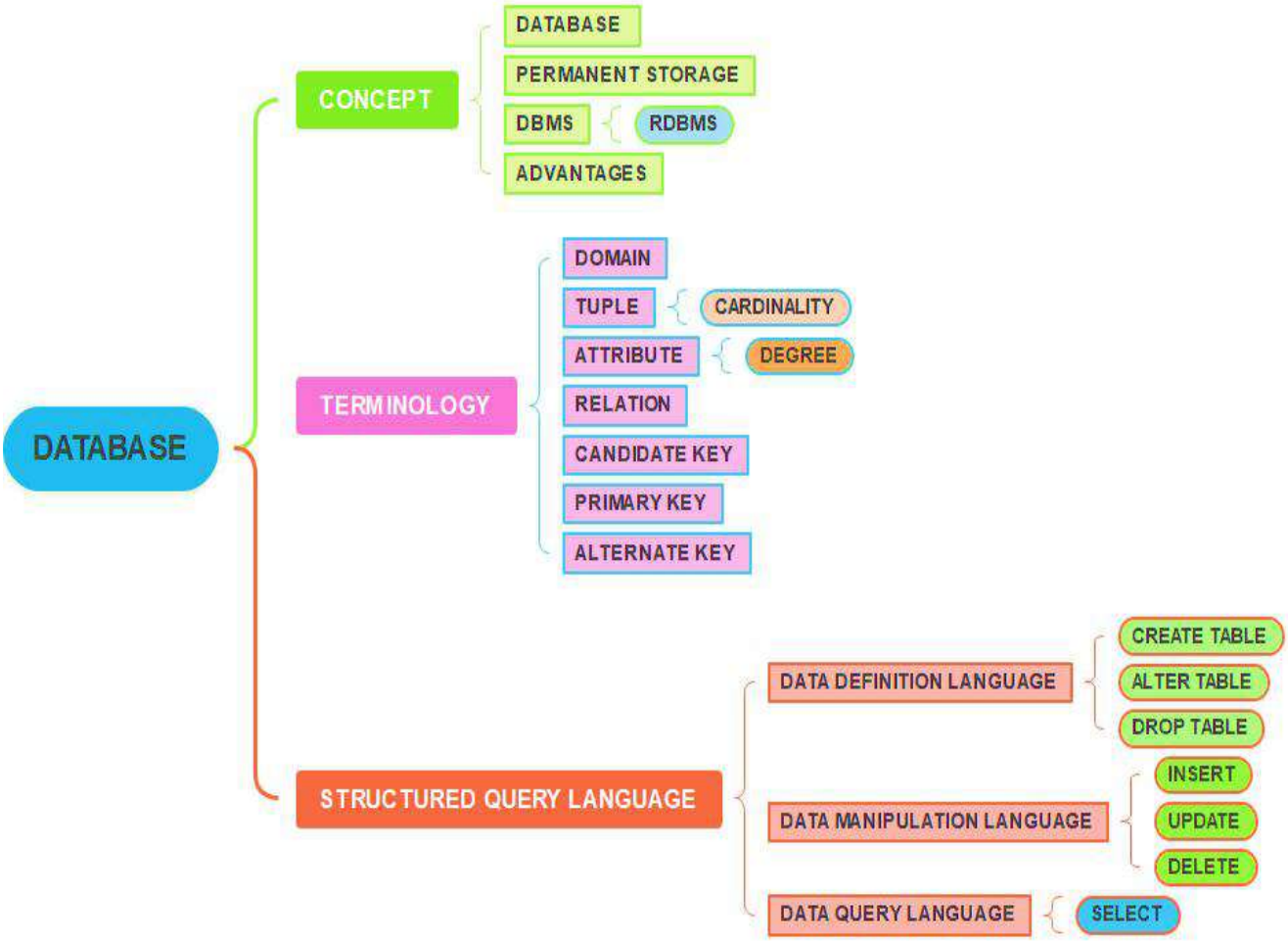
i) NumPy
ii) import numpy as np
iii) arr = np.array(marks)
iv) array()

v) (4)arr = np.array(marks)

UNIT 3: DATABASE CONCEPTS AND SQL

Database Concepts

Mind Map



Database Concepts

- **Database**
  A **database** is an **organized collection of data** that can be easily accessed, managed, and updated.
  A database helps us to store our data in the **permanent memory.**
- **DBMS**
  A database management system (DBMS) or database system in short, is a software that can be used to create and manage databases.
  DBMS lets users to create a database, store, manage, update/modify and retrieve data from that database by users.
  Some examples of DBMS are MySQL, Oracle, PostgreSQL, SQL Server, Microsoft Access, MongoDB.
- **RDBMS**
  RDBMS stands for Relational DBMS.
  Different types of DBMS are available and their classification is done based on the underlying data model.
  There are three Data Models: Hierarchical, Network, and Relational.
  A data model describes the structure of the database, including types of data, relationship between the data and rules(constraints) on data.

The most commonly used data model is Relational Data Model.

- **Advantages of a database**
  1. **Reduced Data Redundancy**
     Data is stored in one place and it is shared and thus avoids duplication.
  2. **Data Consistency**
     Centralized data updates ensure all users see the same, up-to-date information.
  3. **Data Integrity**
     Rules (otherwise known as constraints) ensure valid and accurate data (e.g., age of a person is non-negative).
  4. **Improved Data Security**
     User access can be controlled (e.g., some users can only read, others can update).
  5. **Data Sharing**
     Multiple users and applications can access the data simultaneously without conflict.
  6. **Backup and Recovery**
     Automatic tools help recover data in case of failure or crashes.

TERMINOLOGY

Domain	It is a set of values from which an attribute can take a value in each row. Usually, a data type is used to specify domain for an attribute.
Tuple	Each row of data in a relation (table) is called a tuple.
Attributes	Each column of a relation (table) is called an attribute.
Cardinality	The number of tuples in a relation is called the Cardinality of the relation.
Degree	The number of attributes in a relation is called the Degree of the relation.
Database Schema	Database Schema is the design of a database. It is the skeleton of the database that represents the structure (table names and their fields/columns), the type of data each column can hold, constraints on the data to be stored (if any), and the relationships among the tables. Database schema is also called the visual or logical architecture as it tells us how the data are organised in a database.
Data Constraint	Sometimes we put certain restrictions or limitations on the type of data that can be inserted in one or more columns of a table. This is done by specifying one or more constraints on that column(s) while creating the tables.
Meta Data	The database schema along with various constraints on the data is stored by DBMS in a database catalog or dictionary, called meta-data. A meta-data is data about the data.
Query	A query is a request to a database for obtaining information in a desired way. Query can be made to get data from one table or from a combination of tables.
Database Engine	Database engine is the underlying component or set of programs used by a DBMS to create database and handle various queries for data retrieval and manipulation.

Example:
Consider the student table given below:

StudentID	Name	Age	Grade	Mobile
101	Aman	14	A	1111145689
102	Ajay	15	B	1111131212

Name of relation: **Student**

Domain: In the above relation, the attribute StudentID takes integer values and hence its domain is a set of integer values.

Degree: Degree of this table is 5 as it has 5 attributes (columns)

Name of attributes: StudentID, Name, Age, Grade, Mobile

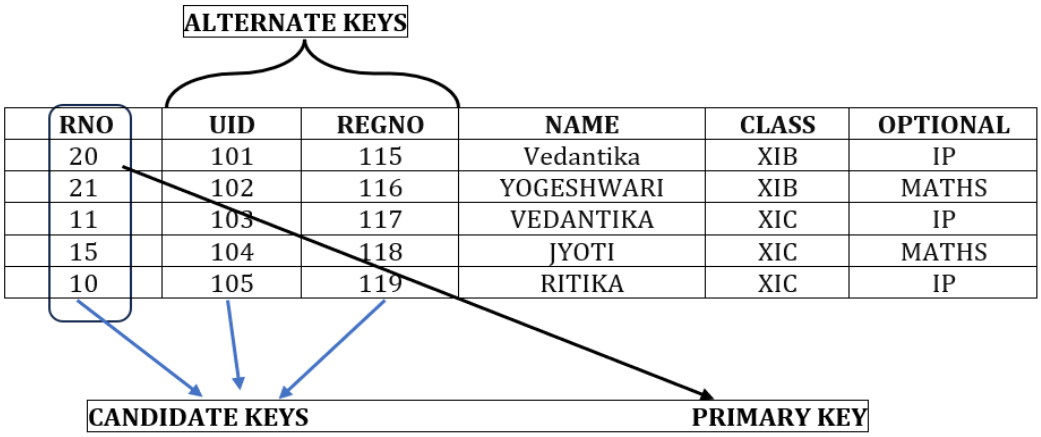
Cardinality: Cardinality of this table is 2 as this table contains 2 tuples(rows/records) of data

Keys of a relation

Candidate Keys	A relation can have one or more attributes that takes distinct values. Any of these attributes can be used to uniquely identify the tuples in the relation. Such attributes are called candidate keys
Primary Key	Out of one or more candidate keys, the attribute chosen by the database designer to uniquely identify the tuples in a relation is called the primary key of that relation. If no single attribute in a relation is able to uniquely distinguish the tuples, then more than one attribute is taken together as primary key. Such primary key consisting of more than one attribute is called Composite Primary key
Alternate Key	From the candidate keys, the attributes which are not chosen as primary key are called Alternate key
Foreign Key	A foreign key is used to represent the relationship between two relations. A foreign key is an attribute whose value is derived from the primary key of another relation.

For example- in below table following attributes(columns) **RNO, UID, REGNO** are candidate keys, suppose we have chosen **RNO as primary Key**. Then the other two **attributes (column) UID, REGNO** will become **alternate key.**

Let's understand the above-mentioned terms with the help of a Table:



RNO	UID	REGNO	NAME	CLASS	OPTIONAL
20	101	115	Vedantika	XIB	IP
21	102	116	YOGESHWARI	XIB	MATHS
11	103	117	VEDANTIKA	XIC	IP
15	104	118	JYOTI	XIC	MATHS
10	105	119	RITIKA	XIC	IP

In the above table

1. There are 5 tuples (rows/ records), hence the **CARDINALITY is 5**
2. There are 6 Attributes and hence **DEGREE is 6**
3. **RNO, UID AND REGNO** are unique for each student and hence are eligible to become Primary Key. They are **CANDIDATE KEYS.**
4. RNO is chosen as **PRIMARY KEY.**
5. So UID & REGNO becomes **ALTERNATE KEYS.**

Example of Foreign Key: -

- It is a column or a set of columns in one table that refers to the primary key in another table.
- It establishes and enforces a link between the data in two tables

Tablename:DOCTOR

DID	DNAME	DEPT	EXP	PHONE	DOJ
1110	AJAY	ORTHO	3	999	2000-09-05
1111	VIVEK	CARDIO	2	977	1995-10-10
1186	PRASHANT	SK	4	8999	2003-01-10
1160	NEHA	PI		94853	1999-12-20

FOREIGN KEY

Tablename:PATIENT

PID	NAME	ROOM_NO	DID
1	Ajay	101	**1110**
2	Bhuvan	203	**1186**
3	Chandra	207	**1111**

In Patient table, the primary key of Doctor table is present, which helps us to link these two tables. Hence **DID in patient table** is the **Foreign Key.**

Note:

The table whose primary key is present in another table, is known as **parent table**. Here in the above example DOCTOR table is the parent table

The table in which, foreign key is present is known as the **Child table**. In the above example PATIENT is the child table.

PID is the primary key of patient table.

Three Important Properties of a Relation

In relational data model, following three properties are observed with respect to a relation which makes a relation different from a data file or a simple table.

Property 1: imposes following rules on an attribute of the relation:

- Each attribute in a relation has a unique name.
- Sequence of attributes in a relation is immaterial.

Property 2: governs following rules on a tuple of a relation.

- Each tuple in a relation is distinct.
- Sequence of tuples in a relation is immaterial.

Property 3: imposes following rules on the state of a relation.

- All data values in an attribute must be of same data type
- Each data value associated with an attribute must be atomic
- No attribute can have many data values in one tuple.
- A special value "NULL" is used to represent values that are unavailable or not applicable or not known at the moment.

Structured Query Language

Database management systems there are special kind of programming languages called **query language** that can be used to access data from the database.

The Structured Query Language (SQL) is the most popular query language used by major relational database management systems such as MySQL, ORACLE, SQL Server, etc.

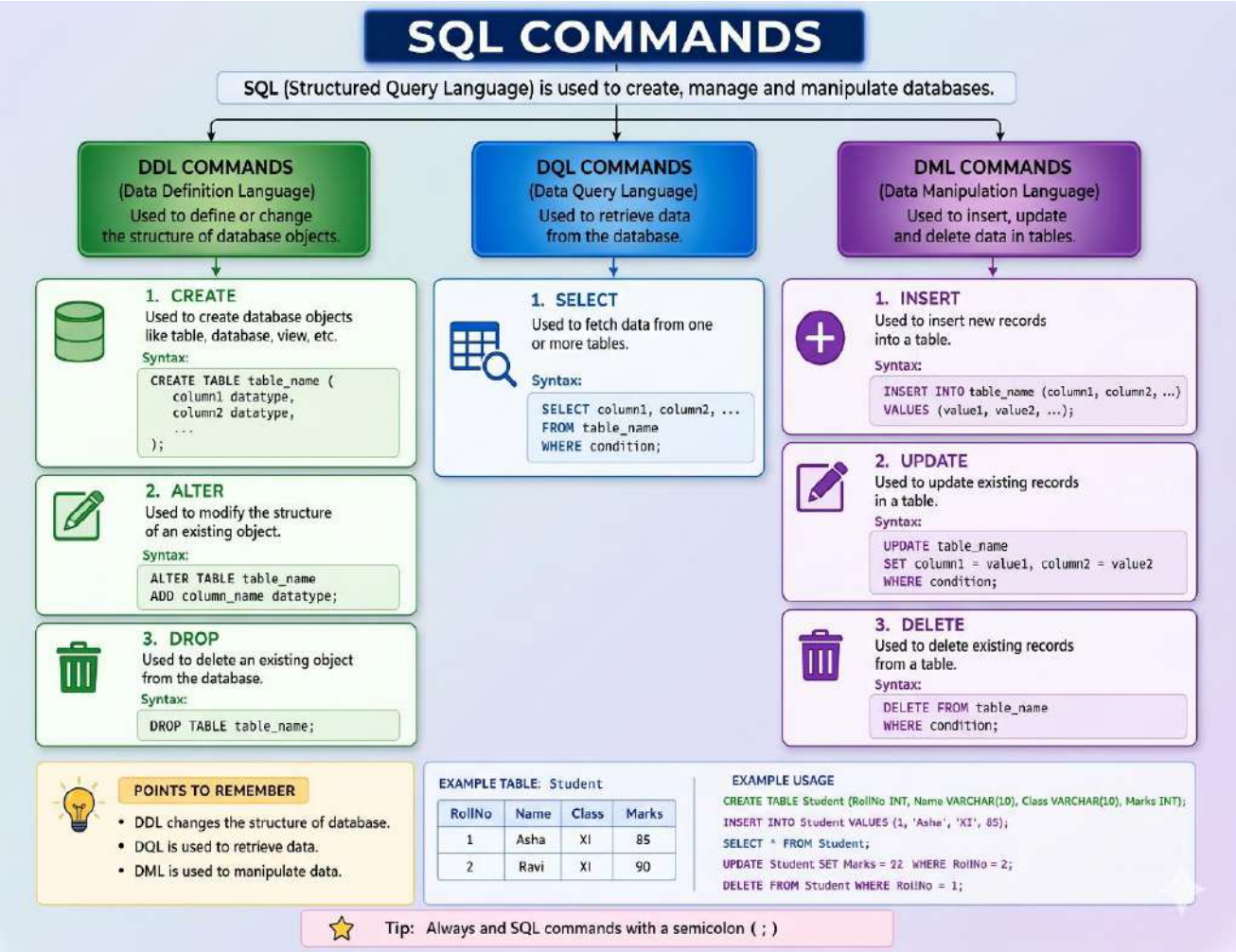
Features and Advantages of SQL

- SQL (**Structured Query Language**) was invented by **Donald D. Chamberlin** and **Raymond F. Boyce** in the early 1970s at **IBM**.
- SQL uses simple, English-like syntax
- SQL is supported by all major RDBMS platforms, making it portable across systems with little to no change.
- SQL is not case sensitive
- SQL statements ends with semi colon (;)

Categories of SQL commands

The SQL commands can be classified mainly into 3 categories:

- Data Definition Language
- Data Manipulation Language
- Data Query Language



Data Definition Language (DDL):

The structure of a relation consists of the number of attributes, their data types, keys and constraints that we keep on the values of attributes.

The commands used for creating, modifying or deleting the structure of a relation are called DDL commands

Example: CREATE TABLE, ALTER TABLE, DROP TABLE.

Data Manipulation Language (DML):

The data of a relation(table) is contained in the rows/records.

The commands used to create, modify or delete rows/records in a relation are called DML commands.

Example: INSERT INTO, UPDATE, DELETE FROM

Data Query Language (DQL):

Data Query **Language (DQL)** is a subset of SQL used **only for querying data** from a database. It focuses on **retrieving information** without changing the data.

Example: SELECT

Datatypes in MySQL
The various datatypes of MySQL are

1. **<u>INT OR INTEGER</u>**:
   A medium integer. Signed range is from -2147483648 to 2147483647. Unsigned range is from 0 to 4294967295.
2. **<u>FLOAT</u>:**
   A floating-point number. Syntax: FLOAT (SIZE, D)
   The total number of digits is specified in **size**. The number of digits after the decimal point is specified in the **d** parameter.
   Example: FLOAT (10,2) means total size 10 out of that 2 digits are in the decimal part.
3. **<u>DATE</u>**:
   Takes date in the form of 'YYYY-MM-DD'. DATE displayed in a format like YYYY-MM-DD, **which contains 10 characters**, but that is the display format, not necessarily the storage size. The size of DATE datatype in MySQL is typically uses **3 bytes** for storage.
4. **<u>CHAR:</u>**
   It is FIXED length string (can contain letters, numbers, and special characters). The size can be from 0 to 255. Default is 1.
5. **<u>VARCHAR</u>**:
   It is **Var**iable length **Char**acter (can contain letters, numbers, and special characters). The size can be from 0 to 65535.

<u>Note:</u>

1. MySQL commands are case **insensitive**.
2. All the commands in MySQL should be terminated by**;** (semicolon)

Create Command

This command is used to create a database/table /view.

Syntax:

Create database **<databasename>**;

Note:

Once a database is created, we have to use it. To use a database, the command is **USE <databasename>**;

Example:

mysql> create database **SCHOOL**;

```
mysql> Create database school;
Query OK, 1 row affected (0.08 sec)
```

mysql>use **SCHOOL**;

```
mysql> Use school;
Database changed
```

CREATING A TABLE:

SYNTAX:

CREATE TABLE <TABLENAME> (FIELD1 DATATYPE(SIZE), FIELD2 DATATYPE (SIZE)……);

Example:

CREATE TABLE STUDENT (RNO INT (5), NAME VARCHAR (20),CLASS CHAR (3), MARKS INT (3));

```
mysql> create table student
    -> (rollno int,name varchar(20),class char(3),marks int);
Query OK, 0 rows affected (0.10 sec)
```

DESC command

To see the structure of a table we use the command DESC (describe)

DESC <table_name>;

DESC STUDENT;

```
mysql> DESC STUDENT;
+--------+-------------+------+-----+---------+-------+
| Field  | Type        | Null | Key | Default | Extra |
+--------+-------------+------+-----+---------+-------+
| ROLLNO | int         | YES  |     | NULL    |       |
| NAME   | varchar(20) | YES  |     | NULL    |       |
| CLASS  | char(3)     | YES  |     | NULL    |       |
| MARKS  | int         | YES  |     | NULL    |       |
+--------+-------------+------+-----+---------+-------+
4 rows in set (0.08 sec)
```

Multiple Choice Questions

1	**A relation has 10 rows and 5 columns. What will be its degree and cardinality?** (a) Degree: 10, Cardinality: 5 (b) Degree: 15, Cardinality 10 (c) Degree: 5, Cardinality: 10 (d) Degree: 5 , Cardinality: 15

2	**There are 5 candidate keys and one primary key in a table. How many alternate keys are there in that table?** a) 3 b) 4 c) 5 d) 6
3	**A non-key attribute, whose values are derived from primary key of some other table.** a) Alternate key b) Foreign key c) Primary key d) Super Key
4	**Pick the odd one out.** a) Update b) Delete c) Create d) Insert
5	**Which of the following is not an example of DBMS?** a) MySQL b) Microsoft Access c) IBM DB2 d) Google
6	**The default date format in MySQL is:** a) DD/MM/YYYY b) YYYY-MM-DD c) MM-DD-YYYY d) YYYY/MM/DD
7	**SQL stands for** a) Standard Query Language b) Structured Query Language c) Standard Question Language d) Simplified Query Language
8	**The attributes of a relation which are unique in their values and which are eligible to become primary key are called** a) Alternate Key b) Foreign Key c) Candidate Key d) Eligible Key
9	**Which of the following best describes a** primary key**?** a) A key that can accept null values b) A key that uniquely identifies each record in a table c) A duplicate value identifier d) A key used to join two tables
10	**How many** candidate keys **can a table have?** a) Only one b) Zero c) One or more d) Exactly two
11	**A foreign key in one table refers to:** a) A primary key in the same table b) A duplicate value in another table c) A primary key in another table d) A unique constraint in any table
12	**Which of the following is a DDL command?** a) SELECT b) UPDATE c) CREATE d) INSERT
13	**Which statement is used to modify the structure of an existing table?** a) CHANGE b) ALTER c) UPDATE d) MODIFY
14	**Which of the following is a** DML **command?** a) CREATE b) SELECT c) DROP d) DELETE
15	**The SELECT statement in SQL is classified under:** a) DML b) DDL c) DCL d) DQL
16	**What is the purpose of DQL in SQL?** a) Query and retrieve data b) Control access to data c) Define data structure d) Delete data
17	**DBMS stands for** a) Data Borrowing and Movement Software b) Database Management System c) Digital Base Mapping System d) Database Manipulation Software

Answer (Multiple Choice Questions)

1	(c) Degree: 5, Cardinality: 10
2	(b) 4 Alternate Keys

3	(b) Foreign key
4	(c) Create
5	(d) Google
6	(b) 'YYYY-MM-DD'
7	(b) Structured Query Language
8	(c)Candidate Key
9	(b)A key that uniquely identifies each record in a table
10	(c)One or more
11	(c) A primary key in another table
12	(c) CREATE
13	(b)ALTER
14	(d) DELETE
15	(d)DQL
16	(a) Query and retrieve data
17	b) Database Management System

Fill in the Blanks (Questions)

1	_____ is a collection of data arranged in the form of rows and columns.
2	**A** row in a relation(table) is known as _____
3	A Column in a relation(table) is known as _____
4	The number of Tuples in a relation(table) is known as _____
5	The number of attributes in a relation(table) is known as _____
6	Columns which are eligible to become a primary key are known as ___ keys.
7	The column value that uniquely identifies a row in a relation(table) is known as _____key.
8	The command that can be used to start working on an already existing database is _____
9	Collection of logically related records is called _____
10	The file that contains description about the data stored in database is called ____

Answer (Fill in the Blanks -Questions)

1	Relation /Table
2	Tuple
3	Attribute
4	Cardinality
5	Degree
6	Candidate Keys
7	Primary Key
8	Use
9	Database
10	Metadata

Assertion and Reasoning Questions

Choose correct option for given Assertion (A) and Reasoning (R) a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A. c) A is true but R is false. d) A is false but R is true.	
1	**Assertion (A):** Each table must have one primary key. **Reason (R):** Primary key is a set of one or more attributes that uniquely identifies a tuple in a relation.
2	**Assertion (A):** The number of columns in a relation is called the degree of the relation. **Reason (R):** The number of tuples in a relation is called the cardinality of the relation
3	**Assertion (A):** Database management system is an application software which arranges data in a well-organized manner in the form of tables. **Reason (R):** DBMS acts as an interface between the database stored in the computer memory and the user.
4	**Assertion (A**): SQL has efficient mechanisms to retrieve data stored in multiple tables in a MySQL database. **Reason (R):** The SQL statement CREATE is used to retrieve data from the tables in a database and is also called query statement.
5	**Assertion (A**): Data redundancy may lead to data inconsistency. **Reason (R):** When redundant data or the multiple copies of data mismatch, it makes the data inconsistent.
6	**Assertion (A):** A DBMS helps in maintaining data integrity and reduces redundancy. **Reason (R):** A DBMS stores data in multiple independent files without any relationships.
7	**Assertion (A):** An RDBMS organizes data into tables with rows and columns. **Reason (R):** Tables in RDBMS use relationships through keys to ensure data is logically connected.
8	**Assertion (A):** A table can have multiple candidate keys. **Reason (R):** There may be many attributes in a table which contain unique values.
9	**Assertion (A):** The SELECT statement is used to modify data in a table. **Reason (R):** SELECT is part of the Data Query Language (DQL).
10	**Assertion(A):** A foreign key can have duplicate values. **Reason (R) :** A foreign key establishes a relationship between two tables and does not require uniqueness.

Answer (Assertion and Reasoning Questions)

1	**(a)** Both A and R are true and R is the correct explanation of A.
2	**(b)** Both A and R are true but R is not the correct explanation of A.
3	**(a)** Both A and R are true and R is the correct explanation of A.
4	**(c)** A is true but R is false
5	**(a)** Both A and R are true and R is the correct explanation of A.
6	**(c)** A is true but R is false

7	**(a)** Both A and R are true and R is the correct explanation of A.
8	**(a)** Both A and R are true and R is the correct explanation of A.
9	**(d)** A is false but R is true.
10	**(a)** Both A and R are true and R is the correct explanation of A.

Short Questions with Answers

1.	**Sayuj wants to save data permanently in his system for data manipulation purposes. He wants this data to be shared with his friends in a secure manner. Suggest him how a database can be used for this purpose?**
	Answer: A database is an organized collection of data that can be easily accessed, managed, and updated. A database helps us to store our data in the permanent memory**.** A database management system helps many users to access the data and manipulate data. So, Sayuj can take the help of a DBMS software for this purpose.
2.	**Mention any two advantages of using a DBMS.**
	Answer: DBMS lets users create a database, store, manage, update/modify and retrieve data from that database by users or application programs. It reduces data redundancy and inconsistency. It ensures data integrity and maintains standardization of data formats. It facilitates sharing of data.
3.	**Ms Preetha, a teacher has written the details about students of 12A class in her register. Similarly, all the teachers teaching in Class 12A maintains separate registers having the same data. Can you identify the problem in storing same data in multiple locations like this? Define the term 'data redundancy'. How does DBMS help to reduce it?**
	Answer: When the same data is stored in multiple locations like this, the data may become inconsistent due to lack of proper updating of data. Storing the same data at multiple locations causes duplication of data. This is called data redundancy. DBMS facilitate sharing of data. So multiple users can work on the same data. This avoids data redundancy and the problems caused due to data redundancy.
4.	**Rohan wants to collect the date of birth of students of his class. He distributes a form to all students for writing their date of birth. After observing the collected data, Rohan finds that the students have written the date of birth in different formats. What is the problem faced by Rohan Now? How can he overcome this problem?**
	Answer: Rohan finds it difficult to differentiate between date and month because some of them have used DD-MM-YYYY format and others have used MM-DD-YYYY format. Even the number of digits used for writing the year is different in different data. If Rohan saves the data like this, he will find it difficult to manipulate it later. Rohan must have used a standard format for collecting data. DBMS can provide rules and constraints on data so that the data follows the same format everywhere. Also the same data is shared with multiple users. Maintaining the correctness of data is called Data Integrity.
5.	**Explain what is a primary key?**
	Answer: The attribute chosen by the database designer to uniquely identify the tuples in a relation is called the primary key of that relation. For example, in a student table, admission number may be chosen as primary key as this data will not be repeated in the column.

6.	**Ramya is working with 2 tables in a database. She wants to retrieve data from both these tables which are related with each other. How can she achieve this?**
	Answer: She must identify a common column which is present in both the tables. She must set one of them as the foreign key. Foreign key is used to establish a connection between 2 relations.
7.	**Explain what is candidate key.**
	Answer: All the attributes that are eligible to become primary key are called candidate keys.
8.	**Explain what is alternate key.**
	Answer: The candidate keys which are not selected as primary key are called alternate keys.
9.	**What is SQL?**
	Answer: SQL stands for Structured Query Language. All Database management systems use a special kind of programming language called **query language** that can be used to access data from the database. SQL is the most popular query language.
10.	Name any two DML commands in SQL.
	Answer: Insert and Update.
11.	**Name any two DDL commands in SQL. Write the Syntax of Create Command.**
	Answer: Create table and Alter table. CREATE TABLE **<TABLENAME> (FIELD1 DATATYPE(SIZE), FIELD2 DATATYPE (SIZE)……..)**;
12.	**Differentiate DDL and DML commands.**
	Answer: Difference of DDL and DML

DDL	DML
DDL stands for Data Definition Language	DML stands for Data Manipulation Language
DDL commands are used to modify the structure of a relation	DML commands are used to modify the data inside a relation
Eg: Create Table, Alter table, Drop table	Eg: Insert into, Update, Delete

13.	**What do you mean by cardinality and degree of a relation?**
	Answer: The number of tuple of a relation is called cardinality and the number of attributes of a relation is called degree of the relation
14.	**Explain what is metadata?**
	Answer: Data about data is called metadata. It contains the structure (table names and their fields/columns), the type of data each column can hold, constraints on the data to be stored (if any), and the relationships among the tables.
15.	**Give any 2 features of MySQL.**
	Answer: MySQL is an RDBMS and is easy to use and Manage It is an open-source software which is secure, reliable and can handle large volume of data.

16.	**A database has two tables:** **Students (StudentID, Name, ClassID) and Classes (ClassID, ClassName)** **You need to relate students to their respective classes.** **Which key should you use in the Students table to refer to the Classes table?**
	Answer: ClassID

Case Based Question/ Competency Based Question:

Consider the following table Student:
Give answer of below statements (a) to (d) from the given table

Admnno	Name	Class	Age	Email
101	Anjali Gupta	10	15	anjali@gmail.com
102	Rohan Singh	10	14	rohan@gmail.com
103	Neha Sharma	11	16	neha.sharma@gmail.com
104	Aman Verma	10	15	amanv@gmail.com

a. Which column in the STUDENT table is most suitable to be chosen as the **Primary Key**? Why?

b. Which among the attributes have **least** chance to become a candidate key?

c. While trying to add a new row: 102, "Rekha Gupta", 11, 16, xyz@gmail.com the DBMS is giving an error "duplicate entry". What may be the reason?

d. Swayam wants to add details of new students but value of admission no (Admnno) is not available, he has studied that if value is not available for an attribute NULL can be inserted. But when he tried to insert new row with NULL value of Admnno, he gets an error. What would be the reason for that?

Answer:

a. **Admnno** as it will not have any duplicate values.

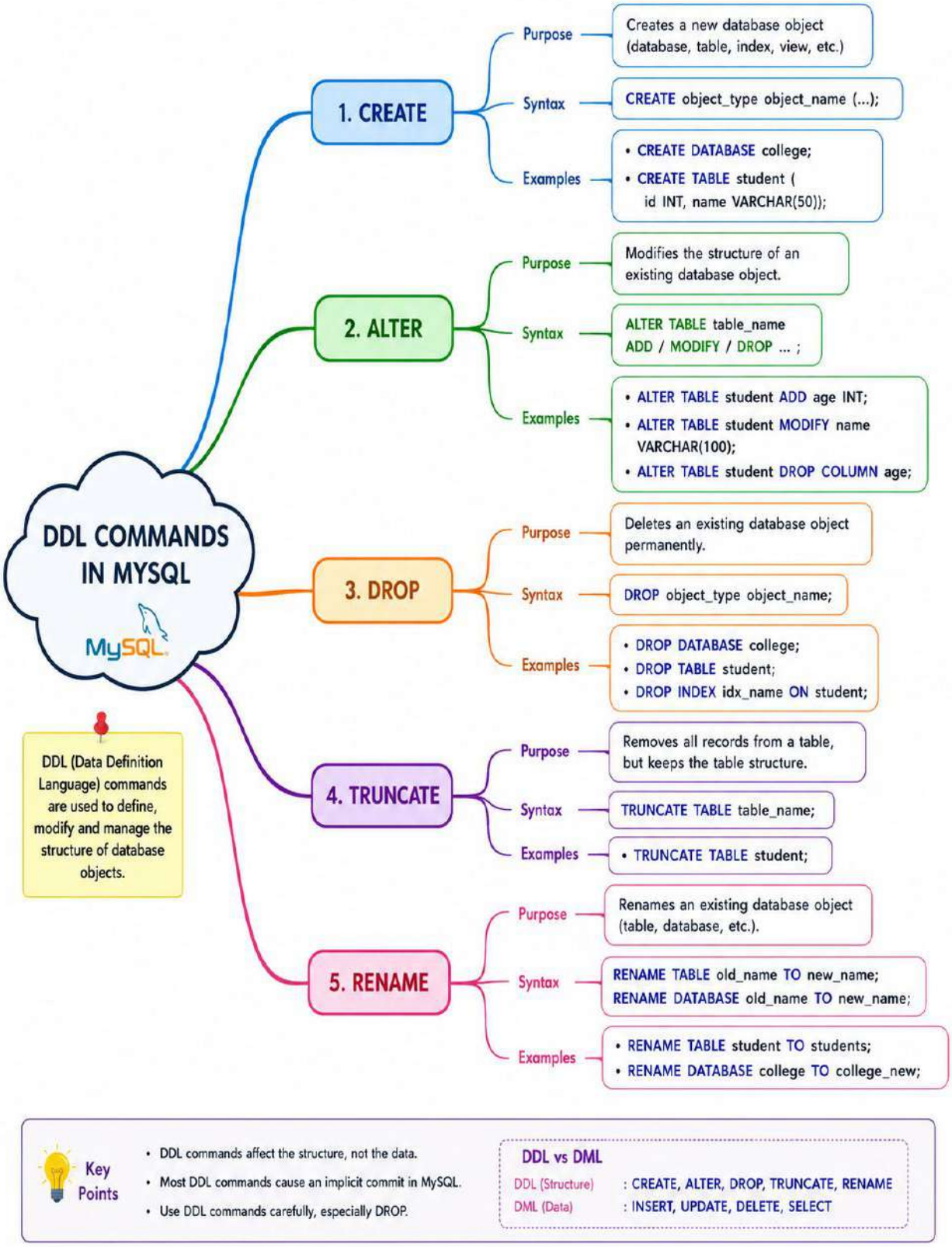
b. **Class** and **Age** attribute cannot become candidate keys as both are having duplicate values.

c. A tuple with **Admnno** 102 already exist in the table and **Admnno** must have been chosen as the Primary Key.

d. Primary key applied on **Admnno** Column. No new record can be inserted in any table, if value of Primary Key column is not given.

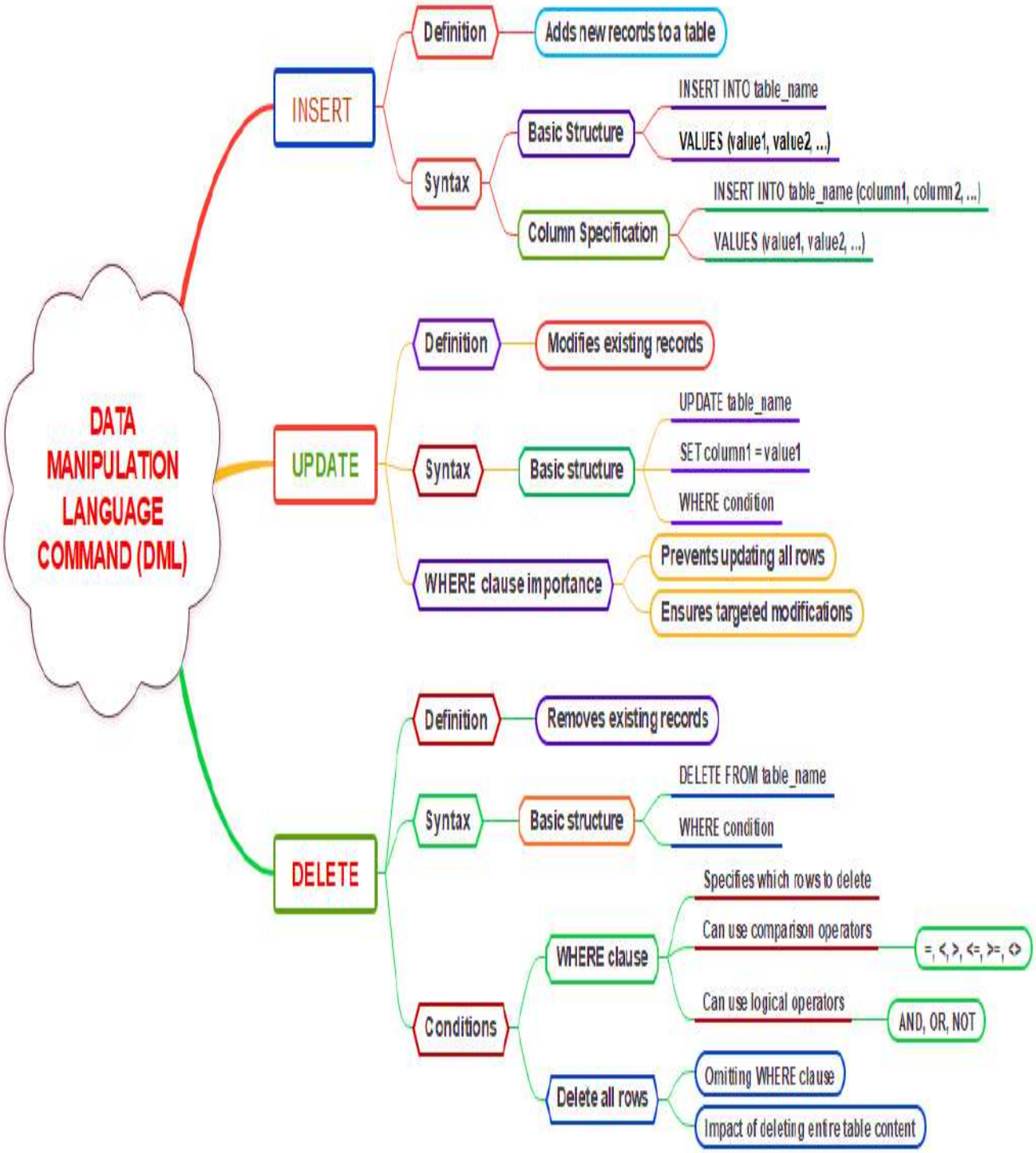
Data Definition Language (DDL)

Mind Map



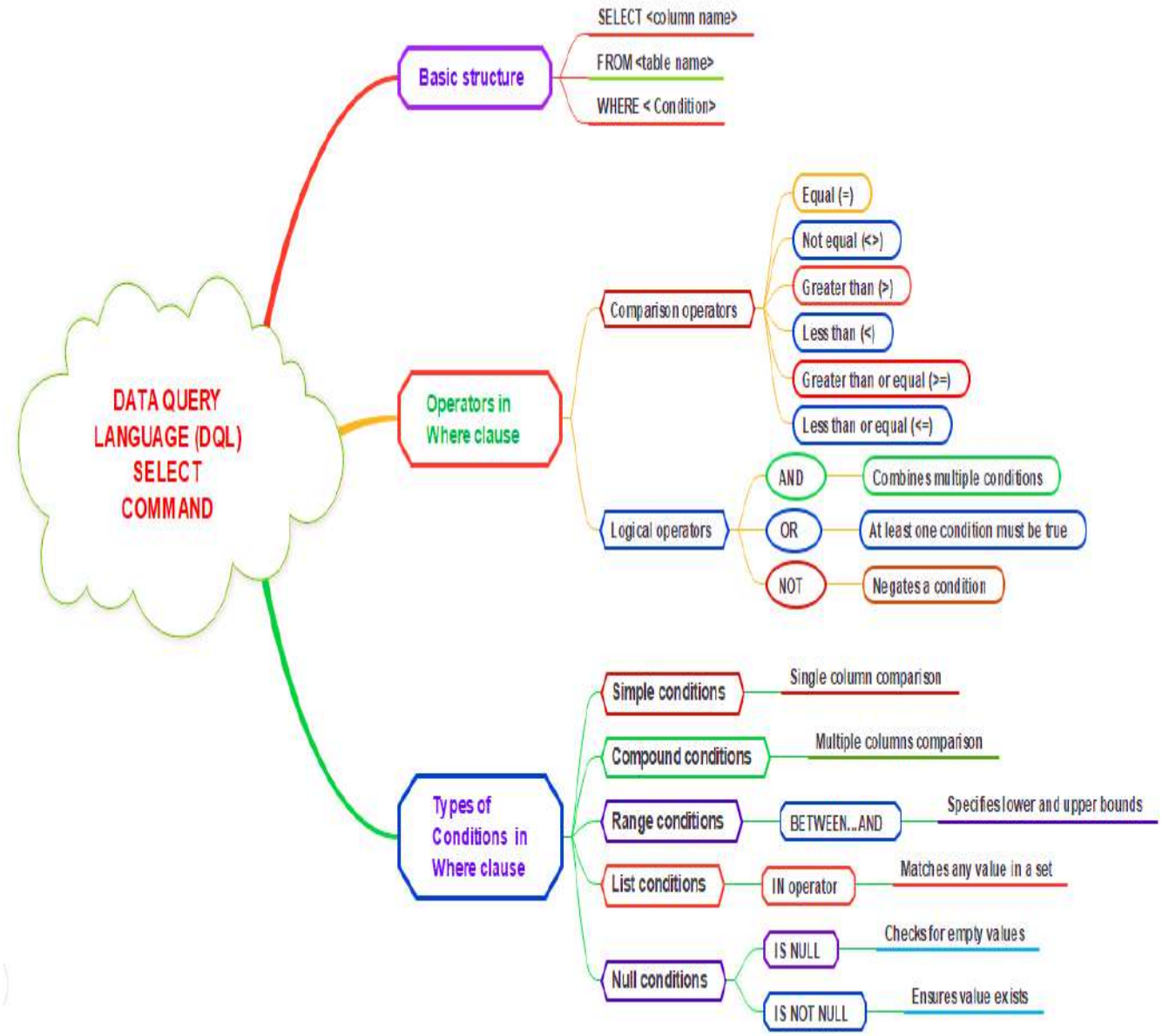
Data Manipulation Language (DML)

Mind Map



Data Query Language (DQL)

Mind Map



- ## Data Query Language (DQL):

Data Query Language (DQL) is an element of SQL**, which is used for retrieving data from the database using the query supplied to it.**
The main example of DQL is **SELECT** statement, which is used to get the data from one or more database tables.

- **SELECT is the primary command used to query and access the data without altering it.** The result of a SELECT against a table or tables is compiled into a separate temporary table that the application, or perhaps a front-end, displays.
- **FROM:** Specifies the table or tables from which you want to retrieve data.
- It **follows** the SELECT clause in the SQL query.
  You can query data from one or more tables by listing them after the FROM keyword

```
mysql> desc sportsclub;
+--------------+-------------+------+-----+---------+-------+
| Field        | Type        | Null | Key | Default | Extra |
+--------------+-------------+------+-----+---------+-------+
| GCode        | int(11)     | YES  |     | NULL    |       |
| GameName     | varchar(20) | YES  |     | NULL    |       |
| Noofclubs    | int(11)     | YES  |     | NULL    |       |
| Fees         | int(11)     | YES  |     | NULL    |       |
| StartingDate | date        | YES  |     | NULL    |       |
+--------------+-------------+------+-----+---------+-------+
5 rows in set (0.06 sec)
```

Table: sportsclub

GCode	GameName	Noofclubs	Fees	StartingDate
101	Carom	2	5000	2004-01-23
102	Badminton	2	12000	2003-12-12
103	Table Tennis	4	8000	2004-02-14
104	Chess	2	9000	2004-01-01
105	Lawn Tennis	4	25000	2004-03-19

- **<u>Selecting Columns:</u> SELECT** statement can be used in various ways and combinations to retrieve subset of columns from one or more tables.

	Purpose	Syntax	Command	Output
1	**Selecting all columns**	SELECT * FROM **<table_name>;**	**SELECT** * **FROM** sportsclub;	mysql> select * from sportsclub; +-------+--------+--------+-------+--------+ | GCode | GameName | Noofclubs | Fees | StartingDate | +-------+--------+--------+-------+--------+ | 101 | Carom | 2 | 5000 | 2004-01-23 | | 102 | Badminton | 2 | 12000 | 2003-12-12 | | 103 | Table Tennis | 4 | 8000 | 2004-02-14 | | 104 | Chess | 2 | 9000 | 2004-01-01 | | 105 | Lawn Tennis | 4 | 25000 | 2004-03-19 | +-------+--------+--------+-------+--------+ 5 rows in set (0.00 sec)
2	**Selecting columns**	SELECT **<column1, column2,…>** FROM **<table_name>;**	**SELECT** GameName, Fees **FROM** sportsclub;	mysql> SELECT GameName, Fees FROM sportsclub; +--------+-------+ | GameName | Fees | +--------+-------+ | Carom | 5000 | | Badminton | 12000 | | Table Tennis | 8000 | | Chess | 9000 | | Lawn Tennis | 25000 | +--------+-------+ 5 rows in set (0.00 sec)
3	**Reordering columns in Query result**	SELECT **<column2, column5, column4>** FROM **<table_name>**;	**SELECT** GameName, StartingDate, Fees **FROM** sportsclub;	mysql> SELECT GameName, StartingDate, Fees FROM sportsclub; +--------+--------+-------+ | GameName | StartingDate | Fees | +--------+--------+-------+ | Carom | 2004-01-23 | 5000 | | Badminton | 2003-12-12 | 12000 | | Table Tennis | 2004-02-14 | 8000 | | Chess | 2004-01-01 | 9000 | | Lawn Tennis | 2004-03-19 | 25000 | +--------+--------+-------+ 5 rows in set (0.00 sec)

- **Selecting specific rows using SELECT command -Where clause:**

  - WHERE clause in SELECT statement is used to filter the data. It selects the specific rows from a table based on the given condition.

* **Syntax:**

SELECT <column1, column2, …>
FROM <table_name>
WHERE <condition>;

➢ Text Fields vs. Numeric Fields

SQL requires single quotes or double quotes around text values. However, numeric fields should not be enclosed in quotes.

	Purpose	Query	Command	Output
1	**Selecting rows based on numeric fields.**	Display all details from a table sportsclub with GCode 101.	**SELECT** * **FROM sportsclub WHERE** GCode=101;	mysql> select * -> from sportsclub -> where GCode=101; +-------+----------+----------+------+--------------+ | GCode | GameName | Noofclubs | Fees | StartingDate | +-------+----------+----------+------+--------------+ | 101 | Carom | 2 | 5000 | 2004-01-23 | +-------+----------+----------+------+--------------+ 1 row in set (0.00 sec)
2	**Selecting rows based on text of a fields (column)**	Display all the details of chess from a table sportsclub.	**SELECT** * FROM sportsclub **WHERE** GameName= **'Chess'**;	mysql> select * -> from sportsclub -> where GameName='Chess'; +-------+----------+----------+------+--------------+ | GCode | GameName | Noofclubs | Fees | StartingDate | +-------+----------+----------+------+--------------+ | 104 | Chess | 2 | 9000 | 2004-01-01 | +-------+----------+----------+------+--------------+ 1 row in set (0.00 sec)
3	**Selecting specific columns of rows based on condition**	To Show the game name and fees from a table sportsclub with two no of clubs.	**SELECT** GameName, Fees **FROM** sportsclub **WHERE** Noofclubs=2;	mysql> SELECT GameName, Fees -> FROM sportsclub -> WHERE Noofclubs=2; +----------+-------+ | GameName | Fees | +----------+-------+ | Carom | 5000 | | Badminton | 12000 | | Chess | 9000 | +----------+-------+ 3 rows in set (0.00 sec)

Use of Operators in WHERE Clause

➢ Comparison Operators:

In the above example, we have used equal to (=) operator in the WHERE clause for exact match conditions. We can also use other relational/comparison operators **(<, <=, >, >=, ! =, < >)** to specify conditions other than exact match.

Operator	Query	Command	Output
> **(Greater than)**	Display the name of game, fees, no of clubs of sportsclubs who have charged fees more than 10000.	**SELECT** GameName, Fees, Noofclubs **FROM** sportsclub **WHERE** Fees >10000;	mysql> select GameName,Fees,Noofclubs -> from sportsclub -> where Fees >10000; +----------+-------+----------+ | GameName | Fees | Noofclubs | +----------+-------+----------+ | Badminton | 12000 | 2 | | Lawn Tennis | 25000 | 4 | +----------+-------+----------+ 2 rows in set (0.19 sec)
<= **(Less than or equal to)**	Display the game code, name of game, starting date from a table sportsclub, who have started on or before 1st Jan 2004.	**SELECT** GCode, GameName, startingDate **FROM** sportsclub **WHERE** startingDate <= '2004-01-01';	mysql> select Gcode,GameName,startingdate -> from sportsclub -> where startingdate <= '2004-01-01'; +-------+----------+----------+ | Gcode | GameName | startingdate | +-------+----------+----------+ | 102 | Badminton | 2003-12-12 | | 104 | Chess | 2004-01-01 | +-------+----------+----------+ 2 rows in set (0.09 sec)
<> **(Not Equal to)**	Display all rows from the sportsclub table except those where the GameName is chess.	**SELECT * FROM** sportsclub **WHERE** GameName <> 'Chess';	mysql> SELECT * FROM sportsclub -> WHERE GameName <> 'Chess'; +-------+----------+----------+-------+----------+ | GCode | GameName | Noofclubs | Fees | StartingDate | +-------+----------+----------+-------+----------+ | 101 | Carom | 2 | 5000 | 2004-01-23 | | 102 | Badminton | 2 | 12000 | 2003-12-12 | | 103 | Table Tennis | 4 | 8000 | 2004-02-14 | | 105 | Lawn Tennis | 4 | 25000 | 2004-03-19 | +-------+----------+----------+-------+----------+ 4 rows in set (0.17 sec)

➢ Logical operators:

In a WHERE clause, logical operators like **AND, OR, and NOT** are used to combine multiple conditions and create more complex filters for data retrieval. These operators help to define the criteria for which rows are included in the result set.

Operator	Query	Command	Output
AND Rows are selected only if **both (or all) conditions are true**.	Display details of all games that have exactly 2 clubs **and** fees charge is less than 10,000 from a table sports club.	**SELECT * FROM** sportsclub **WHERE** noofclubs =2 **AND** Fees < 10000;	mysql> select * -> from sportsclub -> where noofclubs = 2 AND fees < 10000; +-------+----------+----------+------+----------+ | GCode | GameName | Noofclubs | Fees | StartingDate | +-------+----------+----------+------+----------+ | 101 | Carom | 2 | 5000 | 2004-01-23 | | 104 | Chess | 2 | 9000 | 2004-01-01 | +-------+----------+----------+------+----------+ 2 rows in set (0.06 sec)

OR Rows are selected if **any one or all condition is true**.	Display details of games that either have fees more than 20,000 or have more than 3 clubs from a table sportsclub.	**SELECT * FROM** sportsclub **WHERE** Fees > 20000 **OR** noofclubs >3;	mysql> SELECT * FROM sportsclub -> WHERE Fees > 20000 OR Noofclubs > 3; | GCode | GameName | Noofclubs | Fees | StartingDate | | 103 | Table Tennis | 4 | 8000 | 2004-02-14 | | 105 | Lawn Tennis | 4 | 25000 | 2004-03-19 | 2 rows in set (0.00 sec)
NOT Negate a condition. It returns rows **where the condition is false**.	Display GCode, Game Name and Starting Date of all games except Chess from a table sportsclub.	**SELECT** GCode, GameName, StartingDate **FROM** sportsclub **WHERE NOT** GameName= 'Chess';	mysql> SELECT * FROM sportsclub -> WHERE NOT GameName = 'Chess'; | GCode | GameName | Noofclubs | Fees | StartingDate | | 101 | Carom | 2 | 5000 | 2004-01-23 | | 102 | Badminton | 2 | 12000 | 2003-12-12 | | 103 | Table Tennis | 4 | 8000 | 2004-02-14 | | 105 | Lawn Tennis | 4 | 25000 | 2004-03-19 | 4 rows in set (0.00 sec)

➢ Between operator:

This clause facilitates us to give a range of values. So, if you want to impose a condition in which you wish to include a range of values, we use the Between clause.

Note: both values are inclusive in the range you give in the "Between" clause

Operator	Query	Command	Output
Between – Range Condition	Display details of all games where the **fees are between 8000 and 20000** from a table sports club	**SELECT * FROM** sportsclub **WHERE fees between 8000 and 20000**;	mysql> Select * from sportsclub -> where fees between 8000 and 20000; | GCode | GameName | Noofclubs | Fees | StartingDate | | 102 | Badminton | 2 | 12000 | 2003-12-12 | | 103 | Table Tennis | 4 | 8000 | 2004-02-14 | | 104 | Chess | 2 | 9000 | 2004-01-01 | 3 rows in set (0.00 sec)

➢ IN -Membership Operator:

The IN operator is used **to filter data for a specified set of values**. It can also be used to replace multiple OR conditions.

Operator	Query	Command	Output
IN – List condition	Show Gcode and Fees of all the games where the Game Name is either 'Carom', 'Chess', or 'Lawn Tennis' from a table sports club	**SELECT * FROM** Sportsclub **WHERE** GameName **IN** ('Carom', Chess', 'Lawn Tennis');	mysql> select Gcode,GameName,Fees -> from sportsclub -> where GameName IN ('Carom','Chess','Lawn Tennis'); | Gcode | GameName | Fees | | 101 | Carom | 5000 | | 104 | Chess | 9000 | | 105 | Lawn Tennis | 25000 | 3 rows in set (0.02 sec)

➢ IS operator- Handling NULL Values:

SQL Supports a special value called NULL to represent a missing or unknown value. For example, the village column in a table called address will have no value for cities. Hence, NULL is used to represent such unknown values. It is important to note that NULL is different from 0 (zero). Also, any arithmetic operation performed with NULL value gives NULL. For example: 5 + NULL = NULL because NULL is unknown hence the result is also unknown. In order to check for NULL value in a column, we use IS NULL.

Operator	Query	Command	Output
IS Operator- Handling NULL values	(i) Displays all games where **StartingDate is not yet assigned**	**(i) SELECT * FROM** sportsclub **WHERE startingDate IS NULL;**	(i) mysql> Select * From sportsclub -> where startingDate IS NULL; Empty set (0.00 sec)
IS NOT Operator- Handling no NULL values	(ii) Displays GameName where **StartingDate is assigned** from the table sportsclub	**(ii) SELECT * FROM** sportsclub **WHERE** startingDate **IS NOT NULL;**	mysql> select GameName -> from sportsclub -> Where startingDate IS NOT NULL; +---------+ | GameName | +---------+ | Carom | | Badminton | | Table Tennis | | Chess | | Lawn Tennis | +---------+ 5 rows in set (0.00 sec) (ii)

➢ Like operator- Substring pattern matching:

Many a times we come across situations where we don't want to query by matching exact text or value. Rather, we are interested to find matching of only a few characters or values in column values. For example, to find out names starting with 'T' or to find out pin codes starting with '60'. This is called substring pattern matching. We cannot match such patterns using = operator as we are not looking for exact match. SQL provides LIKE operator that can be used with WHERE clause to search for a specified pattern in a column.

The LIKE operator makes use of the following **two wild card characters**:
(i) % (percentage) (ii) (underscore)

Operator	Query	Command	Output
Like operator- Substring pattern matching	(i) Display game code and name of games whose game name starts with 'C' and ends with 's'.	(i) **Select Gcode, Gamename from** Sportsclub **where** Gamename **like 'C%s';**	(i) mysql> select Gcode,GameName -> from sportsclub -> where GameName like 'C%s'; +-------+----------+ | Gcode | GameName | +-------+----------+ | 104 | Chess | +-------+----------+ 1 row in set (0.00 sec)

	(ii) Displays details of all those games whose game name consists of exactly 5 letters and 3rd character is 'r' from a table sports club	(ii) **Select * from** sportsclub **where** Gamename **like '__r__';**	(ii) mysql> select * from sportsclub -> where GameName like '__r__'; +-------+----------+----------+------+--------------+ | GCode | GameName | Noofclubs | Fees | StartingDate | +-------+----------+----------+------+--------------+ | 101 | Carom | 2 | 5000 | 2004-01-23 | +-------+----------+----------+------+--------------+ 1 row in set (0.00 sec)

Example: Combination of both % (multi character pattern matching operator) and _ (single character pattern matching operator)

Query: Displays names of all employees containing 'a' as the second character.
mysql> SELECT EName FROM EMPLOYEE WHERE Ename LIKE '_a%';

Data Manipulation Language (DML):

The SQL commands that deals with the manipulation of data present in the database belong to DML or Data Manipulation Language and this includes most of the SQL statements. It is the component of the SQL statement that controls access to data and to the database.
List of DML commands:

- INSERT: It is used to insert data into a RELATION(**TABLE)**.
- UPDATE: It is used to update existing data in a RELATION **(TABLE)**
- DELETE: It is used to delete records from a database RELATION(**TABLE)**.

Command name	Query	Command/syntax	Output
Insert- Inserting Data into the table	Insert a new record in to sportsclub table (106,'Cricket',6, 30000, '2023-03-03');	**INSERT INTO** <TABLE_NAME> **VALUES** (<val1>, <val2>…);	mysql> insert into sportsclub values -> (106,'Cricket',6,30000,'2023-03-03'); Query OK, 1 row affected (0.01 sec)
Inserting data by specifying column names in **INSERT INTO** command	Add a new record in sportsclub table (107,'Judo',2, 15000, '2024-01-01');	**INSERT INTO** <TABLE_NAME> (<col_name>, <col_name>,…) **VALUES** (<val1>, <val2>…);	mysql> insert into sportsclub -> (GCode,GameName,Noofclubs,Fees,startingDate) -> values (107,'Judo',2,15000,'2024-01-01'); Query OK, 1 row affected (0.01 sec)
Update- Data Updating – to make changes in the value(s) of	(i) Increase fees of all games by Rs. 500	**(i) UPDATE all rows-** **UPDATE** <TABLE_NAME> **SET** <columnname = value>;	mysql> update sportsclub -> set Fees=Fees+500; Query OK, 7 rows affected (0.02 sec) Rows matched: 7 Changed: 7 Warnings: 0

one or more columns of existing records in a table.	(ii) Change the name of Judo club to 'Judo and Taekwondo'.	**(ii) UPDATE specific rows-** **UPDATE** <TABLE_NAME> **SET**<columnname = value> **WHERE** <condition>;	mysql> update sportsclub -> set GameName='Judo and Taekwondo' -> where GameName='Judo'; Query OK, 1 row affected (0.01 sec) Rows matched: 1 Changed: 1 Warnings: 0
DELETE - The DELETE statement is used to delete one or more record(s) from a table	(i) Delete all the rows from sportsclub.	**(i) Syntax to DELETE all rows:** **DELETE FROM** <TABLE_NAME>;	mysql> delete from sportsclub; mysql> select * from sportsclub; Empty set (0.00 sec) * Data of sportsclub tables gets deleted
	(ii) Delete all games having noofclubs <4	**(ii) DELETE specific rows:** **DELETE FROM** <TABLE_NAME> **WHERE** <Condition>;	mysql> delete from sportsclub -> where noofclubs <4; Query OK, 4 rows affected (0.01 sec)

- **DDL Commands in MySQL**

  DDL (Data Definition Language) commands are used to define and manage database structures like tables, databases, indexes, etc.

- **Main DDL Commands in MySQL**

Command	Purpose
CREATE	Creates database or table
ALTER	Modifies table structure
DROP	Deletes database or table
RENAME	Renames a table

ALTER Command in MySQL:
The ALTER command of DDL in MySQL is used to modify the structure of an existing table (add, delete, or change columns, constraints, etc.).

- **Basic Syntax**

ALTER TABLE table_name action;

- **Common ALTER Operations:**

1. ADD COLUMN
Syntax: ALTER TABLE table_name ADD column_name datatype;
Eg: ALTER TABLE student ADD age INT;

2. ADD MULTIPLE COLUMNS

Syntax: ALTER TABLE table_name ADD (column1 datatype, column2 datatype);
Eg: ALTER TABLE student ADD (city VARCHAR (30), marks INT);

3. MODIFY COLUMN
Used to change datatype or size of a column.
Syntax: ALTER TABLE table_name MODIFY column_name new_datatype;
Eg: ALTER TABLE student MODIFY name VARCHAR (50);

4. CHANGE COLUMN NAME
Syntax: ALTER TABLE table_name
CHANGE old_column_name new_column_name datatype;
Eg: ALTER TABLE student CHANGE name student_name VARCHAR(50);

5. DROP COLUMN
Syntax: ALTER TABLE table_name DROP COLUMN column_name;
Eg: ALTER TABLE student DROP COLUMN age;

6. RENAME TABLE
Syntax: ALTER TABLE old_table_name RENAME TO new_table_name;
Eg: ALTER TABLE student RENAME TO students;

- **DROP Command in MySQL:**

  The **DROP** command of **DDL** in **MySQL** is used to delete existing database objects permanently. Once dropped, the data is usually not recoverable, so use it carefully.

Common Uses of DROP Command:
1. Drop a Database
Syntax: - DROP DATABASE <databasename>;
Eg:- DROP DATABASE school;
2. Drop a Table
Syntax: - DROP TABLE <tablename>;
Eg:- DROP TABLE student;
3. Drop Multiple Tables
Syntax: - DROP TABLE <table1, table2>;
Eg:- DROP TABLE student, teacher, library;
4. Drop a Column (using ALTER)
Syntax: - ALTER TABLE <tablename> DROP COLUMN <columnname>;
Eg:- ALTER TABLE student DROP COLUMN age;

Multiple Choice Questions (DQL)

1.	Which of the following is a DQL command? a) INSERT b) UPDATE c) SELECT d) DELETE
2.	The SELECT statement is used to: a) Insert new records b) Delete records c) Modify existing records d) Retrieve data from one or more tables
3.	Which clause is used with SELECT to filter rows based on a condition? a) WHERE b) GROUP BY c) ORDER BY d) HAVING
4.	What is the main use of the WHERE clause in SQL? a) To define a new table b) To sort records c) To filter records based on a condition d) To group records
5.	Which operator is used with the WHERE clause to check for a range? a) BETWEEN b) IN c) LIKE d) AS
6.	Which SQL statement will return all customers with names starting second character with 'M' and last character is M? a) SELECT * FROM Customers WHERE CustomerName LIKE 'M%M'; b) SELECT * FROM Customers WHERE CustomerName LIKE '_M'; c) SELECT * FROM Customers WHERE CustomerName LIKE '__M%M'; d) SELECT * FROM Customers WHERE CustomerName LIKE 'M__%M';
7.	What does the LIKE operator do in the WHERE clause? a) To insert values b) Matches values using patterns c) Checks for NULL values d) Compares numeric ranges
8.	What is the result of this query? SELECT * FROM customers WHERE city = 'Delhi' OR city = 'Mumbai'; a) Customers from any city b) Only customers from Delhi c) Customers from Delhi or Mumbai d) No result
9.	What will the following SQL query return? SELECT * FROM orders WHERE status IS NULL; a) All orders with status set to 'null' b) All orders where status is undefined c) All orders where status is empty string d) Syntax error
10.	Which SQL statement finds employees whose age is between 25 and 35 (inclusive)? a) SELECT * FROM employees WHERE age = 25 AND 35; b) SELECT * FROM employees WHERE age BETWEEN 25 AND 35; c) SELECT * FROM employees WHERE age > 25 AND < 35; d) SELECT * FROM employees WHERE age IN RANGE (25, 35);

Answers (Multiple Choice Questions) DQL

1.	c) SELECT
2.	d) Retrieve data from one or more tables
3.	a) WHERE
4.	c) To filter records based on a condition
5.	a) BETWEEN
6.	c) SELECT * FROM Customers WHERE CustomerName LIKE '__M%M';
7.	b) Matches values using patterns
8.	c) Customers from Delhi or Mumbai
9.	b) All orders where status is undefined
10.	b) SELECT * FROM employees WHERE age BETWEEN 25 AND 35;

Multiple Choice Questions (DML)

1.	Which of the following is NOT a DML command? a) INSERT b) SELECT c) UPDATE d) DELETE
2.	Which SQL command is used to add new rows to a table? a) ADD b) INSERT c) APPEND d) INCLUDE
3.	The UPDATE statement is used to: a) Add new data b) Delete existing data c) Modify existing data d) Retrieve data
4.	Which keyword is used in UPDATE statement to specify which records should be updated? a) SET b) WHERE c) FROM d) SELECT
5.	To remove records from a table, which command is used? a) ERASE b) REMOVE c) DROP d) DELETE

6.	Which statement will update the salary of employees by 10% in an EMPLOYEE table?
	a) UPDATE EMPLOYEE SET salary = salary + 10;
	b) UPDATE EMPLOYEE ADD salary = (Salary * 0.1) + Salary;
	c) UPDATE EMPLOYEE SET salary = (Salary * 0.1) + Salary;
	d) MODIFY EMPLOYEE SET salary = salary + 10;

7.	What will happen if you execute DELETE FROM table_name; without a WHERE clause? a) Syntax error b) Deletes a random row c) Deletes all rows d) Deletes only the first row
8.	Which of the following statements is used to insert multiple rows in one query? a) INSERT ALL INTO…. b) INSERT MULTIPLE INTO ... c) INSERT INTO table_name VALUES (), (), (); d) MULTI INSERT INTO ...
9.	Which of these statements is true about the DELETE statement? a) It removes the entire table permanently. b) It can be used with a WHERE clause to remove selected rows. c) It requires the use of SET d) It always deletes just one row.
10.	What is the result of the following SQL query? DELETE FROM students WHERE marks < 40; a) Deletes students with exactly 40 marks b) Deletes students with more than 40 marks c) Deletes students with less than 40 marks d) Syntax error

Answer (Multiple Choice Questions) DML:

1.	b) SELECT
2.	b) INSERT
3.	c) Modify existing data
4.	b) WHERE
5.	d) DELETE
6.	c)UPDATE EMPLOYEE SET salary = salary * 1.10;

7.	c) Deletes all rows
8.	c) INSERT INTO table_name VALUES (), (), ();
9.	b) It can be used with a WHERE clause to remove selected rows.
10.	c) Deletes students with less than 40 marks

Assertion and Reasoning Questions

Choose correct option for given Assertion (A) and Reasoning (R) a) Both A and R are true, and R is the correct explanation of A. b) Both A and R are true, but R is not the correct explanation of A. c) A is true, but R is false. d) A is false, but R is true.	
1.	**Assertion (A):** The SELECT statement can modify data in a table. **Reason (R):** SELECT is a part of DQL and is used for retrieving data.
2.	**Assertion (A):** In SQL, INSERT INTO is a Data Definition Language (DDL) Command. **Reason (R):** DDL commands are used to create, modify, or remove database structures, such as tables.
3.	**Assertion (A):** The INSERT, UPDATE, and DELETE commands are part of DML. **Reason (R):** These commands manipulate the data stored in database tables.
4.	**Assertion:** The SQL WHERE clause is used for sorting the result set of a query. **Reason(R):** The WHERE clause specifies conditions to filter rows in a query.
5.	**Assertion:** The IS NULL operator in SQL checks if a column has a NULL value. **Reason(R):** The IS NULL operator checks if a column contains a specific value.
6.	**Assertion (A):** The DELETE command can be used to remove all rows from a table. **Reason (R):** The DELETE statement requires a WHERE clause to execute.
7.	**Assertion (A):** Both BETWEEN and IN operators can choose from a range of values. **Reason (R):** The value ranges and a list of values are interpreted in different ways in SQL.
8.	**Assertion (A):** The UPDATE command in SQL can modify existing records in a table. **Reason (R):** The INSERT command is used to add new rows to a table.
9.	**Assertion (A):** The LIKE operator is used in SQL to filter records based on pattern matching. **Reason (R):** The LIKE operator supports wildcards such as % for multiple characters and _ for a single character.
10.	**Assertion (A):** DML commands can affect the structure of the database schema. **Reason (R):** Commands like INSERT, UPDATE, and DELETE do not change the database structure.

Answer (Assertion and Reasoning Questions)

1.	D) A is false, but R is true. **Explanation:** SELECT only retrieves data and does not modify it.
2.	D) A is false, but R is true. **Explanation:** INSERT INTO is a DML command.
3.	a) Both A and R are true, and R is the correct explanation of A.
4.	D) A is false, but R is true. **Explanation: Assertion is false** because the WHERE clause is **not** used for sorting. **Reason is true** - the WHERE clause is indeed used to **filter rows** based on a condition

5.	c) A is true and R is False Explanation: **Assertion is True**: The IS NULL operator checks if a column **does *not* have a value**, i.e., it's **null**, meaning "unknown" or "missing". **Reason is false**: IS NULL does **not** check for a *specific* value—it checks for the **absence** of any value at all.
6.	c) A is true and R is False Explanation: **Assertion is True**: You **can delete all rows** using DELETE FROM table_name; **Reason is false**: But a WHERE clause is **optional** — it's used to delete **specific** rows, not mandatory.
7.	a) Both A and R are true, and R is the correct explanation of A.
8.	b) Both A and R are true, but R is not the correct explanation of A.
9.	a) Both A and R are true, and R is the correct explanation of A.
10.	d) A is False, R is true

Short type Questions with Answer:

SNo.	Questions
1.	For finding the names of all the students who have enrolled for "Commerce" group in class XI from the "Exam" table, Rishab has typed the following command, but he is not getting the expected result. Kindly help him by rewriting the command to get the expected output. **Select name from Exam where group like "Commerce";**
	Ans: Corrected query is **Select name from Exam where group ="Commerce";** As Equal to (=) operator is used for exact matching.
2.	Sita has given following MySQL command to remove details of students who has not paid the fees. But it is showing some error. Help Sita to correct it and justify your answer. **DELETE * FROM STUDENT WHERE FEES=NULL;**
	Ans: Corrected query is **DELETE FROM STUDENT WHERE FEES IS NULL;** NULL values are compared with IS operator only.
3.	In SQL, how can you change ''Arnav' into 'Shivam'' in the 'FirstName' column in the Persons table?' Write the SQL query to do the same.
	Ans. Update Persons Set FirstName='Shivam'' Where FirstName=''Arnav';
4.	Correct the error in the following query. **Select * from RECORD where Rname = %math%;**
	Ans. Select * from RECORD where Rname like %math%; LIKE operator is used for pattern matching.
5.	Find the error in the following query and rewrite it: **DELETE * FROM STUDENT;**

	Ans. DELETE FROM STUDENT; It is the correct query because * is not part of the syntax of DELETE Command.
6.	You have a database table named "Students" with columns "StudentID," "FirstName," "LastName," and "Age." Write an SQL query to delete all students below the age of 18.
	Ans. DELETE FROM Students WHERE Age < 18;
7.	Write a query to display details of all those employees from EMPLOYEE table whose name contains 7 characters, 3rd character is 'M' and 5th character is 'K'.
	Ans. Select * from EMPLOYEE where Ename LIKE '_ _M_K_ _';
8.	**Match the following operators** Column A — Column B (a) range matching operator — (i) <> (b) multi character pattern matching operator — (ii) NOT (c) logical operator — (iii)_(underscore) (d) list matching operator — (iv) % (e) Single character pattern matching operator — (v) Between (f) relational operators — (vi)IN
	Ans. Column A — Column B (a) range matching operator — (v) Between (b) multi character pattern matching operator — (iv) % (c) logical operator — (ii) NOT (d) list matching operator — (vi)IN (e) Single character pattern matching operator — (iii)_(underscore) (f) relational operators — (i) <>
9.	Explain the purpose of the SQL SELECT statement and provide an example of how it is used to retrieve specific data from a database table.
	Ans. The SQL SELECT statement is used to retrieve specific data from a database table without altering it. Example: SELECT FirstName, LastName FROM Employees;
10.	Differentiate between Alter and Update command.
	Ans.

Alter Command	Update Command
(i) It is a DDL command.	**(i)** It is a DML command
(ii) It is used to change the columns of the existing table such as: **Adding a new column, deleting a column, Changing the data type of the column, renaming a column.** It is also used to add or delete the constraints on an existing table.	(ii) It is used to modify some or all records of the table specified by a condition.

Long type Questions with Answer:

SNo.	Questions

1. Write output for (i) to (iv) MySQL queries on **Customer table:**

Table: CUSTOMER

ACCOUNTNO	CNAME	AGE	GENDER	BALANCE	ACCOUNTCODE
101	S k yadav	62	M	80000	7777
102	Viba mishra	52	F	90000	9999
103	Didar singh	32	M	75000	7777
104	M sharma	35	M	79000	Null
105	Simi arora	30	F	97000	8888
106	Dayal soni	26	M	68000	9999

(i) SELECT ACCOUNTNO, CNAME, BALANCE
FROM CUSTOMER WHERE CNAME LIKE '%N%';

(ii) SELECT * FROM CUSTOMER
WHERE AGE>50 AND BALANCE>80000;

(iii) SELECT ACCOUNTNO, CNAME FROM CUTOMER
WHERE ACCOUNTCODE NOT IN (7777,9999);

(iv) SELECT * FROM CUSTOMER WHERE ACCOUNTCODE IS NULL;

Answer:

(i)

ACCOUNTNO	CNAME	BALANCE
103	DIDAR SINGH	75000
106	DAYAL SONI	68000

(ii)

ACCOUNTNO	CNAME	AGE	GENDER	BALANCE	ACCOUNTCODE
102	VIBA MISHRA	52	F	90000	9999

(iii)

ACCOUNTNO	CNAME
104	M SHARMA
105	SIMI ARORA

(iv)

ACCOUNTNO	CNAME	AGE	GENDER	BALANCE	ACCOUNTCODE
104	M SHARMA	35	M	79000	NULL

2. Observe the following table Watches and answer the questions from (i) to (iv):

Table: Watches

WATCHID	WATCH_NAME	PRICE	TYPE	QTY_STORE
W001	High Time	10000	Unisex	100
W002	Life Time	15000	Ladies	150
W003	Wave	20000	Gents	200
W004	High Fashion	7000	Unisex	250
W005	Golden Time	25000	Gents	100

(i) Write SQL query to change the Qty_Store of Golden Time watches to 300.

(ii) To display all the details of those watches whose name ends with 'Time'

(iii) Write a query to add the following record in Watches table
('W006','Rolex',25000,'Gents',200)

(iv) Write the query to delete all the records from the table, but table structure should remain in the database.

Answer:

(i) Update Watches Set Qty_Store=300 Where Watch_Name= "Golden Time";

(ii) Select * from Watches where Watch_Name like "%Time";

(iii) Insert into Watches values ('W006','Rolex',25000,'Gents',200);

(iv) Delete from Watches;

3. Write queries for (i) to (iv) which are based on the following table TRAVEL.

Table: TRAVEL

CNO	CNAME	TRAVELDATE	KM	VCODE	NOP
101	K. Niwal	2015-12-13	200	V01	32
103	Fredrick Sym	2016-03-21	120	V03	45
105	Hitesh Jain	2016-04-23	450	V02	42
102	Ravi Anish	2016-01-13	80	V02	40
107	John Malina	2015-02-10	65	V04	2
104	Sahanubhuti	2016-01-28	90	V05	4

(i) To display CNO, CNAME, TRAVELDATE from the table TRAVEL.

(ii) To display the CNAME of all customers from the table TRAVEL who are travelling by vehicle with code V01 or V02

(iii) To display the CNO and CNAME of those customers from the table TRAVEL who travelled BETWEEN '2015-05-01' AND '2015-12-31' '.

(iv) To display all the details from table TRAVEL for the customers, who do not have travel distance 120 KM.

Answer:

(i) Select CNO, CNAME, TRAVELDATE from TRAVEL;

(ii) Select CNAME from TRAVEL where VCODE= 'V01' or VCODE='V02';

(iii) Select CNO, CNAME from TRAVEL **where** TRAVELDATE BETWEEN '2015-05-01' AND '2015-12-31';

(iv) Select * From TRAVEL **where** NOT KM=120;

4. Execute Query based on below Statements (i) to (iv) for table: **SALES**

Ecode	Ename	Address	dojoin	Amount	Area
100	Amit	Delhi	2017-09-29	5000.90	East
101	Sushant	Gurgaon	2025-01-01	7000.75	East
102	Priya	Noida	2024-04-25	3450.45	West
103	Mohit	Delhi	2018-11-03	6000.50	North
104	Priyanshi	Delhi	2019-12-15	8000.62	North

(i) Write a SQL query to display details of all salesmen whose date of joining is after 31st March 2024.

(ii) Display details of all employees whose name starts with 'S' and ends with 't'.

(iii) Display Area, Employee name and PFamount calculated as Amount *0.01 of East or West area employees.

(iv) Write a SQL query to delete the record of Ecode as 102.

Answer:

(i) Select * From Sales **where** dojoin > '2024-03-31';

(ii) Select * From sales **where** Ename like 'S%t';

(iii) Select Area, Ename, Amount*0.01 as PFamount from Sales **where** Area IN ('East', 'West');

(iv) Delete from Watches **where** Ecode=102;

5. Study the following table DOCTOR and answer the following questions: -

TABLE: DOCTOR

ID	NAME	DEPT	GENDER	EXPERIENCE
101	John	ENT	M	12
104	Smith	ORTHOPEDIC	M	5
107	George	CARDIOLOGY	M	10
114	Lara	SKIN	F	3
109	K George	MEDICINE	F	9
105	Johnson	ORTHOPEDIC	M	10
117	Lucy	ENT	F	3

(i) Write SQL Query to display the details of all those Doctors whose name either starts with 'J' or starts with 'S'.

(ii) Write SQL Query to display the details of all female doctors having experience more than 5 years.

(iii) Write the SQL Query to delete the records of Male doctors of ENT dept.

(iv) Write the SQL Query to update the experience of all doctors by 1.

Answer:

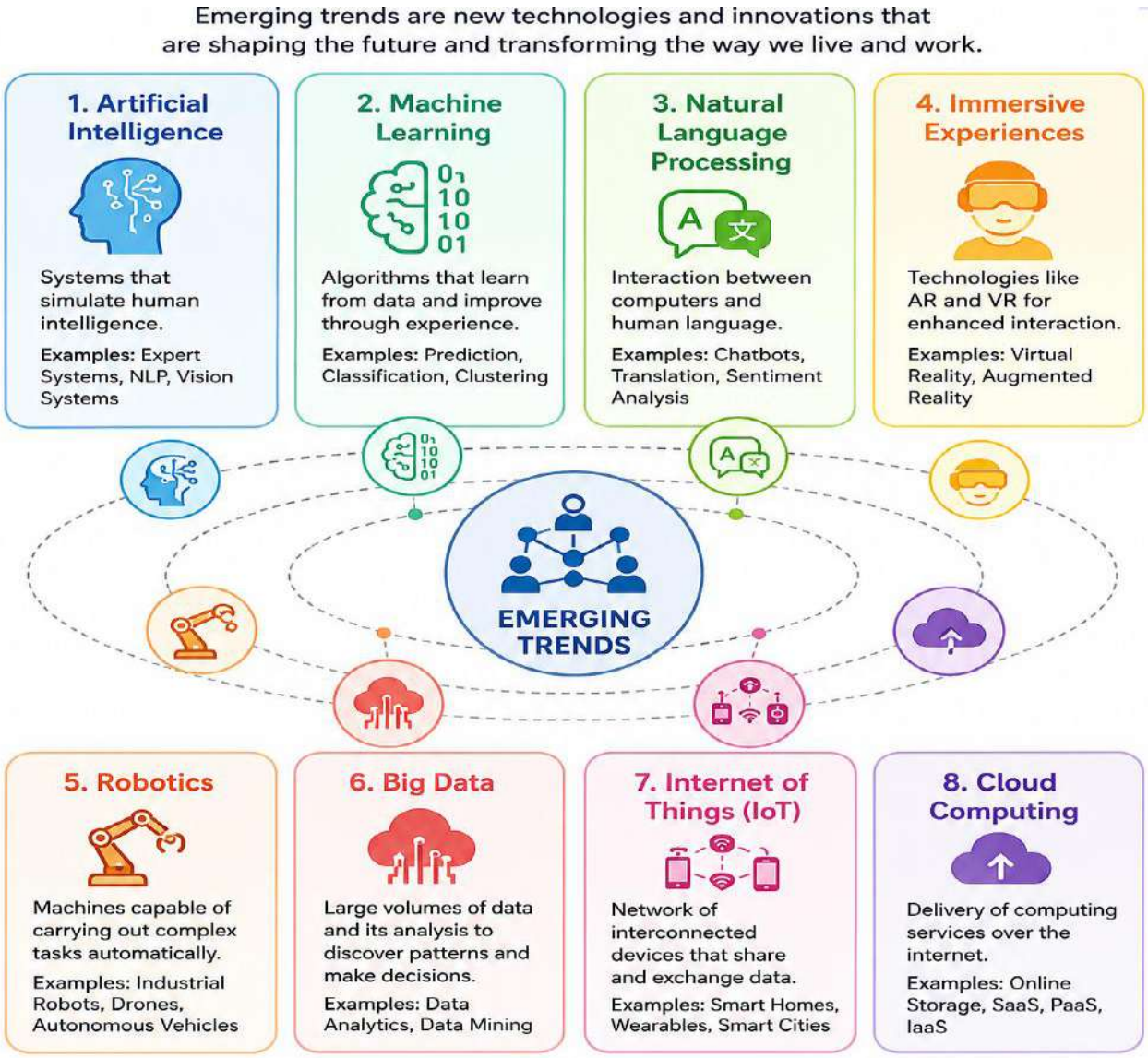
(i) SELECT * FROM Doctor WHERE Name LIKE 'J%' OR Name LIKE 'S%';

(ii) Select * from Doctor Where Gender='F' and Experience>5;

(iii) Delete from Doctor Where Gender='M' and department='ENT';

(iv) Update Doctor Set Experience=Experience+1;

Unit 4: Introduction to the Emerging Trends



1. Artificial Intelligence (AI)

What is it?
AI is a branch of computer science that enables machines to mimic human intelligence. This means they can perform tasks like thinking, learning, problem-solving, and decision-making.

Key Features:
- Learns from experience
- Solves problems
- Makes decisions

Real-life Examples:
- Google Assistant answers your questions.
- Self-driving cars make driving decisions.
- Face recognition on smartphones.

2. Machine Learning (ML)

What is it?
ML is a subset of AI. It means teaching computers to learn from data and make predictions or decisions without being explicitly told what to do every time.

How it works:
- Provide data → Computer analyzes it → Learns patterns → Makes predictions

Examples:
- YouTube recommends videos based on your watch history.
- Email filters move spam messages to the spam folder.

3. Natural Language Processing (NLP)

What is it?
NLP allows computers to understand, interpret, and respond to human language (like English, Hindi, etc.).

Why is it useful?
- It helps machines interact with humans using speech or text.

Examples:
- Google Translate
- Chatbots on websites
- Voice typing on smartphones

4. Immersive Experience (AR & VR)

Augmented Reality (AR):

What is it?
The literal meaning of augmentation is "the act of increasing the size, value or quality of something by adding to it". AR adds digital elements (images, sounds, etc.) to the real world using a smartphone or smart glasses.

Example:
You point your camera at a street, and it shows directions or restaurant reviews.

Virtual Reality (VR):

What is it?
VR creates a completely digital environment. You wear a headset and feel like you're inside a different world.

Example:
Using a VR headset to walk through a virtual museum or play a 3D game.

5. Robotics

What is it?
Robotics is the field of designing and building robots—machines that can do tasks automatically or with minimal human help.

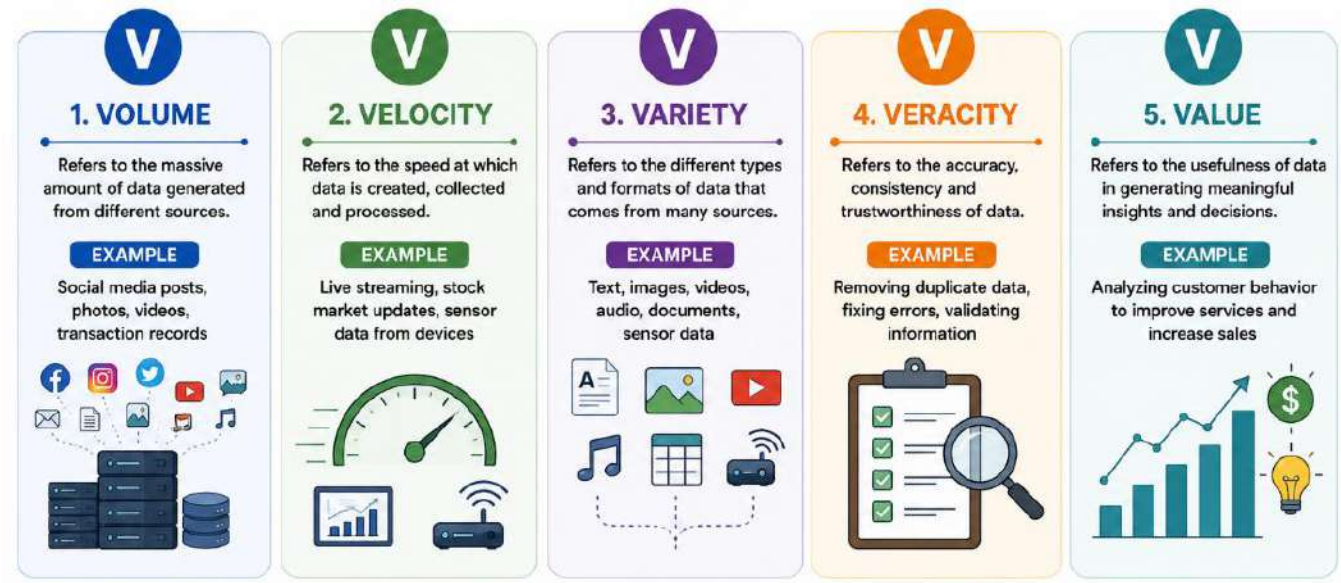
Examples:
- Robot arms in factories
- Drones used for delivery or photography
- Cleaning robots at home

6. Big Data and Its Characteristics

What is Big Data?
Big Data refers to extremely large sets of data that can be analyzed to reveal patterns, trends, and associations.

Characteristics (5 V's):

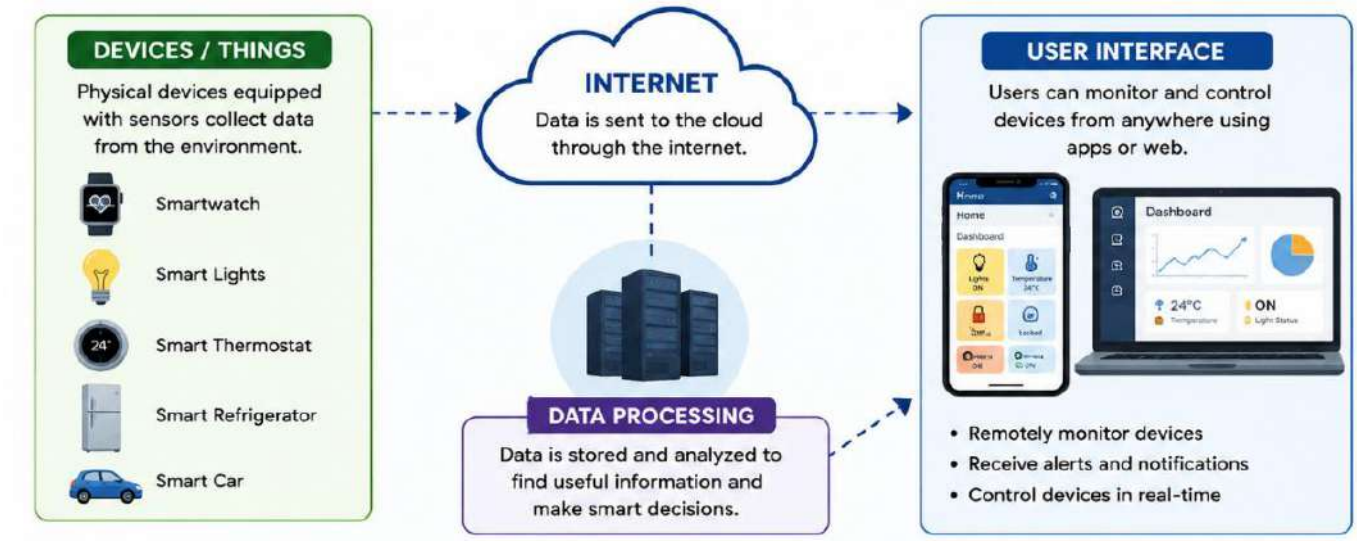
1. **Volume:** Massive amount of data (e.g., social media posts)
2. **Velocity:** Speed at which new data is created and shared
3. **Variety:** Different formats – text, images, videos
4. **Veracity:** Accuracy and trustworthiness of the data
5. **Value:** How useful the data is for making decisions



7. Internet of Things (IoT)

What is it?
IoT connects everyday objects to the internet, allowing them to collect and exchange data.

Examples:
- Smartwatches that track your steps and heartbeat
- Smart lights that can be controlled via phone
- A fridge that tells you when you're out of milk



8. Sensors

What are they?
Sensors detect physical changes in the environment (like temperature, motion, light) and send that information to a computer or device.

Examples:
- Temperature sensor in AC
- Motion sensor in security lights

- Fingerprint scanner on smartphones

9. Smart Cities

What is a Smart City?

A smart city uses technology to manage its resources efficiently and improve the quality of life of its residents.

Features:

- Smart traffic management
- Smart energy use (like automatic street lights)
- Clean and efficient waste management

Examples:

- Cameras that monitor traffic and help reduce congestion
- Apps that tell you when your bus will arrive

10. Cloud Computing

What is it?

Cloud computing means storing and accessing data and applications over the internet instead of your computer's hard drive.

Benefits:

- Access from anywhere
- No need for expensive hardware
- Easy sharing and collaboration

Types of Cloud Services:

- **SaaS (Software as a Service):** Use software online (e.g., Google Docs, Zoom)
- **IaaS (Infrastructure as a Service):** Rent IT infrastructure like servers (e.g., Amazon Web Services)
- **PaaS (Platform as a Service):** Tools for developers to create software (e.g., Microsoft Azure)

11. Grid Computing

What is it?

Grid computing connects multiple computers over a network to work together on a single task working together as a single system.

Why is it used?

- Solves complex problems
- Speeds up processing

Example:

Scientists use grid computing to analyze climate change models or DNA sequencing.

12. Blockchain Technology

What is it?

Blockchain is a digital ledger (record book) where information is stored in blocks and linked in a secure and unchangeable way.

Key Features:

- Decentralized (no single owner)
- Secure and transparent
- Difficult to change once data is added

Uses:

- Cryptocurrency like Bitcoin

- Securely storing property or medical records

Multiple Choice Questions

1.	AI is primarily designed to mimic which aspect of human beings? a) Cognitive thinking b) Emotional intelligence c) Physical strength d) Skeletal structure
2	Which of the following is an example of AI? a) Automatic washing machine b) Automatic Entrance Gate c) Self-driving car d) All of the above
3	Machine Learning is a part of which broader field? a) Web Development b) Cybersecurity c) Artificial Intelligence d) Database Management
4	What does Machine Learning use to make decisions? a) Rules defined by humans b) Data and patterns c) Hardware components d) Programming languages
5	Chatbots use NLP to: a) Diagnose hardware issues b) Control robotic arms c) Understand and respond to human text d) Store large datasets
6	Which of the following uses NLP? a) Google Translate b) Paint software c) File compression tools d) Spreadsheet applications
7	AR enhances the physical world by overlaying: a) Musical compositions b) 3D holograms and digital information c) Printed documents d) File systems
8	Which device is commonly used for experiencing Virtual Reality (VR)? a) Smartphone b) Laptop c) VR headset d) Printer
9	A robot equipped with sensors and actuators is capable of: a) Playing video games b) Autonomously performing tasks c) Sending emails d) Creating animations
10	Which of the following is an example of a robot? a) Fan b) Washing machine c) Self-driving vacuum cleaner d) Keyboard
11	Which of the following is **not** a characteristic of Big Data? a) Volume b) Variety c) Velocity d) Visibility
12	"Variety" in Big Data refer to? a) Speed of data b) Number of users c) Different types of data (text, images, etc.) d) Cost of data
13	What does IoT connect to the internet? a) Physical devices like TVs, lights, and cars b) Only mobile phones c) Website only d) Only computers
14	Smart homes use IoT for: a) Traditional key-based locks b) Managing home appliances remotely c) Manual water heating d) Paper documentation

15	Motion sensors are commonly used in: a) Text editing software b) Social media platform c) Food packaging d) Smart lighting systems
16	Which device commonly uses a fingerprint sensor? a) Television b) Smartphone c) Refrigerator d) Fan
17	Smart traffic lights use data to: a) Change based on fixed time b) Operate manually by policemen c) Optimize traffic flow dynamically d) Work only during the day
18	Which of the following is a feature of a smart city? a) Smart traffic management b) Manual traffic lights c) Paper maps d) Public payphones
19	What does Cloud Computing allow users to do? a) Clean their computers b) Access computing services over the internet c) Build physical servers d) Paint digital images
20	IaaS is used when organizations need: a) Cloud-based software only b) Infrastructure like servers and networking c) Web development platforms d) Voice-based control system
21	Grid Computing combines multiple computers to: a) Share internet only b) Print documents faster c) Work together on a task d) Reduce electricity use
22	Which of the following best describes Grid Computing? a) One powerful computer b) Cloud-based storage c) A software development tool d)A network of computers solving problems together
23	Blockchain stores data in: a) Boxes b) Sheets c) Linked blocks d) File
24	Which of the following is built using Blockchain technology? a) WhatsApp b) Bitcoin c) Antivirus software d) MS Word

Answer (Multiple Choice Questions)

1	(a) Cognitive Thinking
2	(c) Self Driving Car **Explanation**: vehicles use AI to navigate roads, recognize obstacles, and make driving decisions
3	(c) Artificial Intelligence
4	(b) Data and patterns
5	(c) Understand and respond to human text
6	(a) Google Translate
7	(b) 3D holograms and digital information
8	(c) VR headset

9	(b) Autonomously performing tasks
10	(c) Self-driving vacuum cleaner
11	(d) Visibility
12	(c) Different types of data (text, images, etc.)
13	(a) Physical devices like TVs, lights, and cars
14	(b) Managing home appliances remotely
15	(d) Smart Lighting Systems
16	(b) Smartphone
17	(c) Optimize traffic flow dynamically
18	(a) Smart traffic management
19	(b) Access computing services over the internet
20	(b) Infrastructure like servers and networking
21	(c) Work together on a task
22	(d) A network of computers solving problems together
23	(c) Linked blocks
24	(b) Bitcoin

Assertion and Reasoning Questions

Choose correct option for given Assertion (A) and Reasoning (R) a) Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A). b) Both Assertion (A) and Reason (R) are true, and Reason (R) is not the correct explanation of Assertion (A). c) Assertion (A) is true, but Reason (R) is false. **d)** Assertion (A) is false, but Reason (R) is true.	
1	**Assertion (A):** Artificial Intelligence helps machines make decisions like humans. **Reason (R):** AI systems can learn from data and past experiences.
2	**Assertion (A):** Machine Learning improves automatically over time. **Reason (R):** It is based on predefined instructions only.
3	**Assertion (A):** NLP allows computers to understand human speech and text. **Reason (R):** NLP translates machine code into human language.
4	**Assertion (A):** Virtual Reality creates a complete virtual world. **Reason (R):** In VR, the real-world environment is entirely replaced by a digital one.
5	**Assertion (A):** Robots can perform tasks without human intervention. **Reason (R):** Robots are designed with sensors, processors, and actuators.
6	**Assertion (A):** Big Data can be processed using traditional tools like Excel. **Reason (R):** Big Data has high volume, velocity, and variety.

7	**Assertion (A):** IoT allows devices to communicate and share data. **Reason (R):** IoT devices are connected via the internet and often use sensors.
8	**Assertion (A):** Sensors convert physical changes into signals. **Reason (R):** Sensors store large amounts of data.
9	**Assertion (A):** Smart cities aim to improve quality of life using technology. **Reason (R):** Smart cities ignore sustainability and focus only on digital tools.
10	**Assertion (A):** Cloud computing allows access to software and data from anywhere. **Reason (R):** Cloud services are stored on remote servers connected via the internet
11	**Assertion (A):** Grid computing uses a single supercomputer to solve problems. **Reason (R):** Grid computing connects multiple computers to work on a shared task.
12	**Assertion (A):** Blockchain data can be easily changed or deleted. **Reason (R):** Each block in a blockchain is linked and secured using cryptography.

Answer (Assertion and Reasoning Questions)

1	(a) A and R are true, and R is the correct explanation of A.
2	(c) A is true, but R is false.
3	(c) A is true, but R is false.
4	(a) A and R are true, and R is the correct explanation of A.
5	(a) A and R are true, and R is the correct explanation of A.
6	(c) A is false, but R is true
7	(a) A and R are true, and R is the correct explanation of A.
8	(c) A is true, but R is false.
9	(c) A is true, but R is false.
10	(a) A and R are true, and R is the correct explanation of A.
11	(c) A is false, but R is true.
12	(c) A is false, but R is true.

Short Answer Questions **(with Answers)**

1	What is the main difference between AI and Machine Learning?
	Answer: Artificial Intelligence (AI) refers to the broader concept of machines performing tasks that require human intelligence. Machine Learning (ML) is a subset of AI that enables systems to learn and improve from data without being explicitly programmed.
2	Define Big Data. What are its three main characteristics?
	Answer: Big Data refers to extremely large datasets that require advanced tools for processing. Its main characteristics are Volume, Variety, and Velocity.

3	Riya uses a learning app that suggests personalized topics for revision based on her past performance. The app also gives real-time answers and tracks her progress. a) Identify the technology behind the app and how it mimics human intelligence. b) Mention **two** benefits of using such AI-based tools in education.
	Answer:(a) The technology is Artificial Intelligence (AI), which enables the app to analyze past data and make smart decisions, similar to how a teacher might suggest topics. **Answer:(b) (i)** Personalized learning experience and (ii) Instant doubt resolution
4	Medical students use VR headsets to practice surgery in virtual operation rooms that simulate real scenarios. a) Explain how VR creates an immersive experience. b) List **two** benefits of using VR for professional training in the medical field.
	Answer: (a) VR simulates a 3D environment, making users feel as if they are in the real surgical room. **Answer: (b)** (**i)** Risk-free learning and (**ii)** Better hands-on practice.
5	What is meant by SaaS in cloud computing? Give one example.
	Answer: **SaaS** stands for **Software as a Service**. It allows users to access software over the internet. **Example**: **Google Docs.**
6	How does Blockchain ensure the security of data?
	Answer: Blockchain uses cryptographic links between blocks, making it tamper-proof and ensuring that data cannot be changed without altering all subsequent blocks.
7	A farm uses soil sensors that send data to the farmer's phone and automatically switch irrigation pumps on or off. a) Explain how IoT works in this farming setup. b) State **two** advantages of **IoT in agriculture.**
	Answer: (a) Sensors collect data and communicate via the internet to control pumps automatically. **Answer: (b) (i)** Saves water and **(ii)** Increases crop yield.
8	A shopping website recommends clothes and gadgets based on what users have previously browsed or purchased. a) Explain how the website "learns" from user behavior. b) State **two** ways Machine Learning improves user experience in online shopping.
	Answer: (a) The website uses Machine Learning (ML) to detect patterns in user activity and uses algorithms to make future recommendations. **Answer: (b) (i)** Saves time by showing relevant products and **(ii)** enhances user satisfaction
9	A mobile app allows users to see how furniture will look in their room through a phone camera. a) Is this AR or VR? b) Mention one advantage of this technology**.**

	Answer: (a) Augmented Reality (AR). **Answer: (b)** It helps users visualize products before purchasing.

Long Answer Questions (with Answers)

1	Explain the concept of Artificial Intelligence (AI) with two real-life examples. How does it benefit society?
	Answer: **Artificial Intelligence** (AI) refers to machines performing tasks that typically require human intelligence. Examples include: 1. Virtual assistants like Siri or Alexa 2. Autonomous vehicles (self-driving cars) AI benefits society by improving efficiency, accuracy, and enabling automation in areas like healthcare, education, and transportation.
2	Discuss how Machine Learning works. Mention any two types of Machine Learning?
	Answer: **Machine Learning** works by feeding data into algorithms that learn patterns and make decisions. Two types of ML are: 1. Supervised Learning – where the model learns from labelled data. 2. Unsupervised Learning – where the model identifies patterns in unlabeled data.
3	Describe the difference between AR and VR. How are they used in education and entertainment?
	Answer: **AR** overlays digital content on the real world, while **VR** immerses users in a virtual environment. **In education, AR** can enhance textbooks with 3D models; **VR** can simulate lab experiments. **In entertainment, AR** is used in games like Pokémon GO, **while VR** is used in virtual tours and 3D games.
4	Explain the term Big Data. Discuss the 5 V's of Big Data with examples.
	Answer: Big Data refers to massive amounts of structured and unstructured data. **The 5 V's are:** 1. **Volume** – Huge data size (e.g., social media posts) 2. **Velocity** – Speed of data generation (e.g., stock market data) 3. **Variety** – Different data types (e.g., text, video, images) 4. **Veracity** – Data accuracy and trustworthiness 5. **Value** – Useful insights from data (e.g., customer trends)
5	What are the different types of **cloud computing services**? Explain each with examples.
	Answer: The main types of cloud services are: 1. **SaaS (Software as a Service):** Software accessed via internet. Example: Zoom, Google Docs. 2. **PaaS (Platform as a Service):** Platform for developers to build applications. Example: Google App Engine.

	3. **IaaS (Infrastructure as a Service):** Provides virtual hardware. Example: Amazon Web Services (AWS)

Case Based Question/ Competency Based Questions

1	A farmer uses a mobile app connected to soil sensors in his field. The app alerts him about moisture levels and turns irrigation pumps on/off automatically. a) What does IoT stand for? b) How do sensors help in smart farming? c) State one advantage of using IoT in agriculture. d) Mention one device commonly used in IoT-based farming.
	Answer: (a) Internet of Things (b) Sensors collect real-time data like soil moisture, temperature, and humidity, which helps in making timely and accurate decisions for crop management. (c) IoT improves crop yield while reducing water and resource wastage through automated systems. (d) Soil moisture sensor
2	During a flu outbreak, health authorities collect data from hospitals, mobile apps, and pharmacies. They analyze this large and varied data to identify affected areas and predict future spread. a) Which technology is used to handle large and complex data sets? b) Name any two characteristics of Big Data. c) Why is Big Data important for public health planning? d) Give one example of a sector apart from health that uses Big Data.
	Answer: a) Big Data Analytics b) (i) Volume: Refers to the vast amount of data generated. (ii) Variety: Refers to the different types of data (text, images, numbers, etc.). c) It helps in early detection of outbreaks, better allocation of resources, and accurate prediction of disease spread. d) The Retail sector uses Big Data for customer behavior analysis and personalized marketing.
3	A smart city project is being developed to improve the lifestyle of people using modern technologies. The city administration uses sensors to collect traffic data, cloud computing services to store information, Artificial Intelligence to analyze data patterns, and robots for automatic cleaning services. Citizens can also experience important historical places using Virtual Reality (VR) technology. Based on the above case study, answer the following questions:

	i) Name the technology in which machines are designed to perform tasks that normally require human intelligence. ii) What are the devices called that collect data such as temperature, traffic movement, or pollution levels in IoT systems? iii) Identify the technology used to provide users with a computer-generated immersive environment. iv) Name the branch of Artificial Intelligence that enables computers to understand and process human language. v) Which technology allows data and applications to be stored and accessed over the Internet instead of a personal computer? Answer: i) Artificial Intelligence (AI) ii) Sensors iii) Virtual Reality (VR) iv) Natural Language Processing (NLP) **v)** Cloud Computing
4	A smart city project is being developed to improve the lifestyle of people using modern technologies. The city administration uses sensors to collect traffic data, cloud computing services to store information, Artificial Intelligence to analyze data patterns, and robots for automatic cleaning services. Citizens can also experience important historical places using Virtual Reality (VR) technology. Based on the above case study, answer the following questions: (I) Which technology is used in the smart city to collect traffic data through devices? (II) Which technology uses distributed digital records connected in the form of blocks? (III) Name the computing technology in which multiple computers work together to solve a large problem. (IV) Machines capable of performing tasks automatically with minimum human intervention are known as: (V) Which of the following is an example of immersive experience technology? a) Blockchain b) Virtual Reality c) Grid Computing d) Big Data Answer: (I) Internet of Things (IoT) (II) Blockchain Technology (III) Grid Computing (IV) Robots / Robotics (V) (b) Virtual Reality

KENDRIYA VIDYALAYA SANGATHAN

SESSION ENDING EXAM (2026-2027)

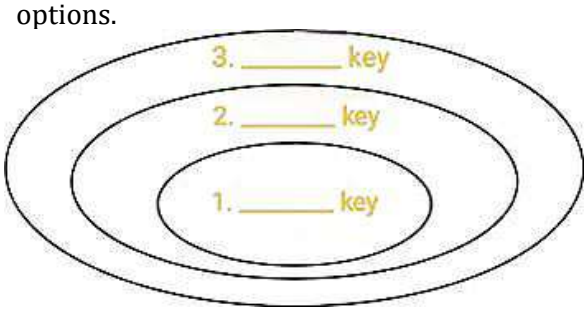
SAMPLE QUESTION PAPER (SOLVED)

Max. Marks: 70 **Time: 3 Hours**

General Instructions:

- Please check this question paper contains 37 questions.
- All questions are compulsory. However, internal choices have been provided in some questions. Attempt only one of the choices in such questions
- The paper is divided into 5 Sections- A, B, C, D and E.
- Section A consists of 21 questions (1 to 21). Each question carries 1 Mark.
- Section B consists of 7 questions (22 to 28). Each question carries 2 Marks.
- Section C consists of 4 questions (29 to 32). Each question carries 3 Marks.
- Section D consists of 2 case study type questions (33 to 34). Each question carries 4 Marks.
- Section E consists of 3 questions (35 to 37). Each question carries 5 Marks.
- All programming questions are to be answered using Python Language only.
- In case of MCQ, text of the correct answer should also be written.

Q No.	Section-A (21 x 1 = 21 Marks)	Marks
1	According to the concept of database, the domain of the attribute Roll_Number for a class having 40 students is: (A) 0-40 (B) 1-40 (C) 40 (D) 0-40.0	1
2	Which the following codes will print 'Raipur' as an output? cities = ['Rai','pur',['Bhilai','Raipur']] print(cities[-1][-1]) # statement i print(cities[-1][1]) # statement ii print(cities[-1].pop()) # statement iii print(cities[0]+cities[1]) # statement iv (A) Only statements i, iii and iv (B) Only statements i, ii and iii (C) Only statements i, ii and iv (D) All of the above statements	1
3	What will be the output of the following code? Nums = [3,4,1,5,2] print(Nums.pop(Nums.pop())) (A) 5 (B) 2 (C) 1 (D) 4	1

4	What will happen if the following query gets executed for Stock table. DELETE FROM Stock; (A) It deletes all rows from the table and also removes the table structure from the database. (B) It deletes all rows from the table but keeps the table structure intact. (C) It removes the table from the database permanently. (D) It throws an error because no WHERE clause is specified.	1
5	Which of the following is not a valid dictionary? (A) {} (B) {True: "Yes", False: "No", None: "Maybe"} (C) {(10, 20, 30): "Tuple", 40: "Integer"} (D) {'a': Apple, 'b': Banana, 'c': Cherry}	1
6	Which of the following functions is used to append a dictionary d2 to another dictionary d1? (A) d1.append(d2) (B) d1.extend(d2) (C) d1.update(d2) (D) d1.add(d2)	1
7	Which of the following is equivalent to 2 MB in terms of other units of digital storage? (A) 2024 KB (B) 2000 KB (C) 4048 KB (D) 2000 Bytes	1
8	What error will be shown when the following code is executed? X = 20 Y = X + 10 I = Z - 5 (A) NameError: name 'Z' is not defined (B) NameError: name 'I' is not defined (C) Syntax Error (D) No error, the code will run successfully.	1
9	To insert 8 to the third position in a list named NList, which command can help? (A) NList.insert(3, 8) (B) NList.insert(8, 3) (C) NList.insert(2, 8) (D) NList.insert(8, 2)	1
10	In a database, the relationship between different types of keys is shown in the Venn diagram below in the form of Fill in the blanks. Identify the correct options.  (A) 1 – Super key, 2 – Candidate key, 3 – Primary key (B) 1 – Candidate key, 2 – Primary key, 3 – Super key (C) 1 – Primary key, 2 – Candidate key, 3 – Super key (D) 1 – Primary key, 2 – Super key, 3 – Candidate key	1

<table>
<tr><td>11</td><td>What is the output of this code?
<pre>x = 5
while x > 0:
  x -= 1
  if x == 3:
    continue
  print(x, end=" ")</pre>
(A) 5 4 3 2 1 0
(B) 4 2 1 0
(C) 4 3 1 0
(D) Infinite loop</td><td>1</td></tr>
<tr><td>12</td><td>Match the following SQL clauses with their descriptions:
<table>
<tr><th colspan="2">SQL</th><th colspan="2">Description</th></tr>
<tr><td>P</td><td>DROP</td><td>1</td><td>Modifies a column</td></tr>
<tr><td>Q</td><td>DELETE</td><td>2</td><td>Removes table and structure</td></tr>
<tr><td>R</td><td>ALTER</td><td>3</td><td>Modifies a row</td></tr>
<tr><td>S</td><td>UPDATE</td><td>4</td><td>Erase table data</td></tr>
</table>
(A) P-2, Q-4, R-3, S-1
(B) P-2, Q-4, R-1, S-3
(C) P-4, Q-3, R-2, S-1
(D) P-4, Q-2, R-1, S-3</td><td>1</td></tr>
<tr><td>13</td><td>Rank the following from slowest to fastest in terms of data transfer speed: HDD, SSD, Cache, RAM.
(A) SSD, HDD, RAM, Cache (B) HDD, SSD, RAM, Cache
(C) HDD, SSD, Cache, RAM (D) HDD, RAM, SSD, Cache</td><td>1</td></tr>
<tr><td>14</td><td>What is the main difference between freeware and FOSS?
(A) FOSS provides access to the source code, while freeware does not.
(B) Freeware allows users to modify the source code while FOSS does not
(C) Freeware is more expensive than FOSS.
(D) There is no difference; they mean the same thing.</td><td>1</td></tr>
<tr><td>15</td><td>The first mechanical device capable of performing simple arithmetic calculations was:
(A) Turing machine (B) Electronic calculator
(C) Analytical engine (D) Abacus</td><td>1</td></tr>
</table>

16	What defines best to Ubuntu: (A) Programming language (B) Web browser (C) Operating System (D) Word Processing Tool	1
17	What is not true regarding **Primary Key** with respect to relational database. (A) Is made of a single column (B) Must have unique values (C) Null values are not allowed (D) All the given statements are true	1
18	State whether the following statement is True or False: In DBMS, all **alternate keys** are **primary keys**.	1
19	A table has a certain number of rows and columns. If a row is deleted and a column is added, what happens to the cardinality and degree of the table? (A) Cardinality increases, degree decreases (B) Cardinality decreases, degree increases (C) Cardinality increases, degree remains the same (D) Cardinality remains the same, degree decreases	1
Q-20 and Q-21 are Assertion (A) and Reason (R) Type questions. Choose the correct option as: (A) **Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A)** (B) **Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A)** (C) **(C)Assertion (A) is True, but Reason (R) is False** (D) **(D)Assertion (A) is False, but Reason (R) is True**		
20	**Assertion (A):** IN SQL, Null is a special value. **Reason (R):** NULL is equivalent to 0 (zero).	1
21	**Assertion (A):** In SQL, the WHERE clause, when used with >=, AND, and <=, functions similarly to the BETWEEN operator. **Reason (R):** In SQL, the BETWEEN operator specifies a range of values that a column value must fall within, including both endpoints.	1
Q No.	**Section-B (7 x 2 = 14 Marks)**	**Marks**
22	(A) What is Internet of Things (IoT)? Name any two primary components of IoT system. **OR** (B) What does the term 'Big Data' signify? What are the Characteristics of Big Data.	2

<table>
<tr><td>23</td><td>Shreshtha wrote the following code to modify List1 based on a condition. The code should append the number 8 to List1 if its length is greater than 2. Otherwise, it should repeat List1 thrice. However, the code contains errors. Identify and correct these errors by rewriting the corrected code and underlining the changes made.
Shreshtha's Code:
List1 = [1, 2, 3]
if List.len()>2:
    List1 = List1 + [8]
else:
List1 == List1 * 3
print(List1)</td><td>2</td></tr>
<tr><td>24</td><td>Given the following Trainer table, identify the fields, domain, tuple, and relation with proper labelling:
<table>
<tr><td>Code</td><td>Name</td><td>Age</td><td>Gender</td></tr>
<tr><td>1</td><td>S Kunal</td><td>35</td><td>M</td></tr>
<tr><td>2</td><td>Soma Majumdar</td><td>37</td><td>F</td></tr>
</table></td><td>2</td></tr>
<tr><td>25</td><td>Given the dictionary my_d = {'p': 1, 'q': 2, 'r': 3}, write Python code to:
i. delete the key 'q'
ii. clear all elements from the dictionary.
OR
Write a program to traverse through a dictionary to print all the keys and their corresponding values. (myD={1: "ROSHAN", 2: "ROSHANI", 3:"VIJAY"})</td><td>2</td></tr>
<tr><td>26</td><td>What are the main advantages of using Structured Query Language (SQL) in database management? Give two examples of DBMS apart from SQL.
OR
What is the syntax to see all the Databases, access a Database, see all the tables in a given database and to see the structure of a table.</td><td>2</td></tr>
<tr><td>27</td><td>How do the pop() and remove() methods differ in Python lists? Illustrate with an example.
OR
What is the difference between the sort() method and the sorted() function in Python? Provide an example that shows their working.</td><td>2</td></tr>
<tr><td>28</td><td>Consider a table T containing two columns X and Y each of type integer. After the creation of the table, one record (X=1, Y=1) is inserted in the table. Let A and B denote the respective maximum values of X and Y among all records in the table at any point in time. Using A and B, new records are inserted in the table 128 times with X and Y values being A+1, 2*B+1 respectively. It may be noted that each time after the insertion, values of A and B change. What will be the output of the following SQL query after the steps mentioned above are carried out?
SELECT Y FROM T WHERE X = 7</td><td>2</td></tr>
</table>

Q No.	Section-C (4 x 3 = 12 Marks)	Marks
29	Write the full forms of PaaS, SaaS and IaaS. Match the following services with their examples and justify your answer. Service Example A. PaaS 1. Virtual Machines B. SaaS 2. Online Compiler C. IaaS 3. Drop Box	**3**
30	Table **Enrolment** **EnrID** | **RollNo** | **Name** | **Class** | **Section** | **Age** | **EnrDate** 501 | 1001 | Aarav Singh | 4 | A | 11 | 2025-04-15 502 | 1002 | Meera Das | 5 | B | 12 | 2025-05-12 503 | 1003 | Rohan Gupta | 5 | A | 13 | 2025-06-20 504 | 1004 | Priya Shah | 4 | B | 10 | 2025-07-05 505 | 1005 | Raghav Sen | 4 | A | 12 | 2025-07-03 506 | 1006 | Arpit Rai | 5 | A | 11 | 2025-04-05 Write SQL queries for the following questions using the Enrolment table : 1. Retrieve the names and classes of students who are in Class 4 section A. 2. Retrieve the names of students enrolled on or after 2025-05-01. 3. Update the Section of the student with RollNo 1003 to "B".	**3**
31	Write a Python program to count the number of uppercase and lowercase letters in a given string. Example: Input: eContent 2026-27 Output: Uppercase: 1, Lowercase: 7 **OR** Write a program to print the Table of a given number. Example: Input: 5 Output: 5 X 1 = 5 5 X 2 = 10 5 X 3 = 15 5 X 4 = 20 5 X 5 = 25 5 X 6 = 30 5 X 7 = 35 5 X 8 = 40 5 X 9 = 45 5 X 10 = 50	**3**

32

Sales Table

SaleID	ProductName	SalesPerson	Region	SaleDate	TotalAmount
201	Industrial Gear	Rajesh Kumar	North Zone	2025-11-20	25000
202	Steel Beams	Meera Jain	East Zone	2025-11-22	15000
203	Safety Helmets	Sanjay Verma	West Zone	2025-11-25	NULL
204	LED Lights	Priya Mishra	South Zone	2025-11-28	5000
205	Paint Supplies	Anil Kumar	North Zone	2025-12-01	12000

Given above is the Sales table of a company. Please write the SQL commands for the below queries:

1. Write a query to find the details of all sales person whose name ends with "Kumar".
2. Write a query to display the Sales details of the product whose amount is null.
3. Write a query to display the Sales details of product having region name of exactly 9 characters (East Zone and West Zone) and where amount is greater than 5000.

3

Q No.	Section-D (2 x 4 = 8 Marks)	Marks

33

Write a Python program that takes a list of numbers as input and calculates how many times each number appears in the list. The program should create a dictionary where each unique number from the list is a key, and its value is the count of how many times it occurs in the list.

For **example**, if the list is [4, 5, 6, 4, 5, 4], the program should output {4: 3, 5: 2, 6: 1}.

4

34

Here is the structure of a table **Stock** with a sample data. Write SQL queries for the questions that follow**:**

Stock_ID	Stock_Name	Stock_Type	Quantity	Price
1	Laptop	Electronics	15	50000

1. Create a table named Stock with columns for Stock_ID, Stock_Name, Stock_Type, Quantity, and Price with proper datatype and primary key.
2. Modify the Stock table to add a new column Supplier_Name of type VARCHAR(50).
3. Delete the Price column from the Stock table.
4. Which of the columns must be the primary key. Justify your answer.

4

Q No.	Section-E (3 x 5 = 12 Marks)	Marks

35

i. Describe the main components of a computer system along with the diagram. Explain how they are interconnected to perform a task.

ii. Classify the following devices as input, output, or input-output devices: Touchscreen, Microphone, Speaker, Graphics Tablet, External Storage Device

3+2=5

36 | 5

Given the following while loop:

```
i = 10
while i >= 0:
    print(i)
    i -= 2
```

Convert the above while loop into an equivalent for loop.

Convert the below for loop into an equivalent while loop.

```
L=[10,20,30,40,50]
for i in range(len(L)):
    print(L[i])
```

OR

Write a Python program to calculate the income tax based on the following tax slabs:

- If the income is less than or equal to ₹2,50,000, no tax is applicable.
- If the income is between ₹2,50,001 and ₹5,00,000, tax is 5% of the income exceeding ₹2,50,000.
- If the income is between ₹5,00,001 and ₹10,00,000, tax is 10% of the income exceeding ₹5,00,000 plus ₹2,500.
- If the income is greater than ₹10,00,000, tax is 20% of the income exceeding ₹10,00,000 plus ₹12,500.

Your program should ask the user to input their annual income and then calculate and print the income tax based on the above conditions.

37 | 5

Consider the following table **Events,** that is to be organized in a school. Write SQL queries for the questions that follows**:**

Prg_ID	Prg_Name	Date	Location	Participants	Incharge
801	Annual Drama Night	2024-02-28	Auditorium	80	Arjun Patel
802	Dance Performance	2024-03-22	Main Hall	60	Dr. S. R. Verma
803	Musical Concert	2024-04-12	School Grounds	100	Anjali Das
804	Poetry Recitation	2024-05-07	Classrooms	50	Neha Gupta
805	Folk Dance Festival	2024-06-20	Open Ground	70	Rajesh Jain

i. **Insert** a new event into the table with **Prg_ID** as **806**, **Prg_Name** as "**Science Exhibition**," **Date** as **15 July 2024** in proper format," **Location** as "**Science Block**," **Participants** as **120**, and **Incharge** as "**Dr. Kavita Singh**."

ii. **Increase** the number of participants for "**Dance Performance**" by **10**.

iii. **Remove** the record for "**Poetry Recitation**" from the table.

iv. **Change** the **location** of "**Folk Dance Festival**" to "**Cultural Stage**".

v. List all details of programs scheduled between **March 1, 2024**, and **June 1, 2024**.

KENDRIYA VIDYALAYA SANGATHAN

SESSION ENDING EXAM (2026-2027)

CLASS- XI (INFORMATICS PRACTICES –065)

MARKING SCHEME

Q. No	Section A (21 x 1 = 21 Marks)	Marks
1.	**Q1:** B. **1-40** **Solution:** The domain for the attribute *Roll_Number* must include numbers assigned to all students, i.e., 1 to 40. *(1 mark for correct answer)*	1
2.	**Q2:** D. **All of the above statements** **Solution:** All the listed statements output "Raipur" correctly when executed. *(1 mark for correct answer)*	1
3.	**Q3:** C. **1** **Solution:** Nums = [3, 4, 5, 1, 2] print(Nums.pop(Nums.pop())) # Output: 5 The second Nums.pop() removes the last element (2) and returns it. The first Nums.pop(2) removes and returns the element at index 2, which is 5. *(1 mark for correct answer)*	1
4.	**Q4:** B. **It deletes all rows from the table but keeps the table structure intact.** **Solution:** The DELETE statement removes rows while preserving the table structure unless DROP or TRUNCATE is used. *(1 mark for correct answer)*	1
5.	**Q5:** D. **{'a': Apple, 'b': Banana, 'c': Cherry}** **Solution:** values of the dictionary should be enclosed in ' ' or " " or ''' ''' quotes to make them valid strings. *(1 mark for correct answer)*	1
6.	**Q6:** C. **d1.update(d2)** **Solution:** update() add key-value pairs from one dictionary to another. *(1 mark for correct answer)*	1
7.	**Q7:** C. **4048 KB** **Solution:** 1 MB equals 1024 KB in digital storage. *(1 mark for correct answer)*	1
8.	**Q8:** A. **Name Error** **Solution:** The variable L is not defined, resulting in a Name Error. *(1 mark for correct answer)*	1
9.	**Q9:** C. **NList.insert(2, 8)** **Solution:** The insert() function takes the index (2) and the element (6) to insert at 3rd position. *(1 mark for correct answer)*	1

10.	**Q10:** C. **1 – Primary key, 2 – Candidate key, 3 – Super key** **Solution:** The correct labels match the definitions of keys in a relational database. *(1 mark for correct answer)*	**1**
11.	**Q11:** B. **4 2 1 0** **Solution:** The loop skips x == 3 due to continue and prints the remaining values. *(1 mark for correct answer)*	**1**
12.	**Q12:** B. **P-2, Q-4, R-1, S-3** **Solution:** Correct matching of SQL clauses with their purposes. *(1 mark for correct answer)*	**1**
13.	**Q13:** B. **HDD, SSD, RAM, Cache** **Solution:** Cache has the fastest data transfer speed, followed by RAM, SSD, and HDD. *(1 mark for correct answer)*	**1**
14.	**Q14:** A. **FOSS provides access to the source code, while freeware does not.** **Solution:** Freeware is free but does not provide modifiable source code, unlike FOSS. *(1 mark for correct answer)*	**1**
15.	**Q15:** D. **Abacus** **Solution:** Abacus was the earliest mechanical device for calculations. *(1 mark for correct answer)*	**1**
16.	**Q16:** C. **Operating System** **Solution:** Ubuntu is a popular Linux-based operating system. *(1 mark for correct answer)*	**1**
17.	**Q17:** D. **All the given statements are true** **Solution:** The statements about the Primary Key are all valid in relational databases. *(1 mark for correct answer)*	**1**
18.	**Q18: False** **Solution:** all Alternate keys are not primary keys. *(1 mark for correct answer)*	**1**
19.	**Q19:** B. **Cardinality decreases, degree increases** **Solution:** Deleting a row decreases cardinality, and adding a column increases the degree. *(1 mark for correct answer)*	**1**
20.	**Q20:** C. **Assertion (A) is True, but Reason (R) is False** **Solution:** Null represents missing data and is not equivalent to zero. *(1 mark for correct answer)*	**1**
21.	**Q21:** A. **Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A)** **Solution:** The BETWEEN operator includes the specified range, like the conditions combined. *(1 mark for correct answer)*	**1**

Section B (7 x 2 = 14 Marks)		
22.	(A) IoT: Internet of Things (IoT) refers to a network of physical interconnected objects that communicate and share data with minimal human intervention. Two Primary components of IoT systems are: Sensors/Devices, Connectivity OR (B) Big Data: Big Data signifies large datasets that traditional data-processing tools cannot manage. Characteristics: Volume, Velocity, Variety, Veracity, and Value. (1 mark for explanation + 1 mark for diagram/characteristics)	2
23.	**Solution:** Corrected Code: List1 = [1, 2, 3] if **len(List1)** > 2: # **Corrected to 'len(List1)'** List1 = List1**.append(8)** # **Corrected function** else: List1 **=** List1 * 3 # **Corrected indentation and '='** print(List1) *(1/2 marks for each correction)*	**2**
24.	Solution: Field: Columns or attributes (e.g., Code, Name, Age, Gender). Domain: Possible values of a column (e.g., Age: 35, 37). Tuple: A single row in the table (e.g., [1, S Kunal, 35, M]). Relation: The entire table (Trainer Table). *(1/2 marks for each correct answers)*	2
25.	Solution: (A) Delete and clear operations: my_d = {'p': 1, 'q': 2, 'r': 3} del my_d['q'] my_d.clear() *(2 marks for correct code)* **OR** (B) Traverse dictionary: for key, value in myD.items(): print(key, ":", value) *(2 marks for correct code, any other correct alternate solution)*	2
26.	Solution: Advantages of SQL: Easy to learn, manage, and query large databases. Examples of DBMS: Microsoft Access, Oracle Database, MongoDB etc. *(1 mark for advantages + 1 mark for examples)* *OR* SHOW DATABASES, USE db_nm, SHOW TABLES, DESC Table_Name *(1/2 marks for each correct answers)*	2

27.	Solution: (A) pop() vs remove(): Mylist = [1, 2, 3, 4] Mylist.pop(2) # Removes and returns the item at index 2 Mylist.remove(4) # Removes the first occurrence of 4 OR (B) sort() vs sorted(): Mylist = [3, 1, 2] Mylist.sort() # Modifies list1 print(sorted(Mylist, reverse=True))#Returns a new sorted list *(2 marks for correct explanation and examples)*	2
28.	**Solution:** Y=127 *(2 marks for correct answer)*	**2**
	Section C (4 x 3 = 12 Marks)	
29.	Solution: PaaS: Platform as a Service (e.g., Online Compiler) SaaS: Software as a Service (e.g., Dropbox) IaaS: Infrastructure as a Service (e.g., Virtual Machines) Justification: SaaS delivers software, PaaS provides platforms, and IaaS offers infrastructure. *(1 mark for full forms + 1 mark for matching and 1 mark for justification)*	3
30.	**Solution (SQL Queries):** **(i)** Names and classes of students in Class 6, Section A: SELECT Name, Class FROM Enrolment WHERE Class = 4 AND Section = 'A'; **(ii)** Students enrolled after 2023-05-01: SELECT Name FROM Enrolment WHERE EnrDate >= '2025-05-01'; **(iii)** Update Section for RollNo 1003: UPDATE Enrolment SET Section = 'B' WHERE RollNo = 1003; *(1 mark each)*	**3**

31.	**Solution :**
	(A) Count Uppercase and Lowercase:
	s = "eContent 2026-27"
	upper, lower = 0, 0
	for char in s:
	  if char.isupper():
	  upper += 1
	  elif char.islower():
	  lower += 1
	print("Uppercase:", upper, "Lowercase:", lower)
	OR
	(B) Multiplication Table:
	n = int(input("Enter a number"))
	for i in range(1, 11):
	  print(n, "X", i, "=", n*i)
	(3 marks for correct program)
		3

32.	**(i)** Find salespersons with names ending in "Kumar": SELECT * FROM Sales WHERE SalesPerson LIKE '%Kumar'; **(ii)** Display product with null amount: SELECT * FROM Sales WHERE TotalAmount IS NULL; **(iii)** Products in regions with 9-character names and amount > 5000: SELECT * FROM Sales WHERE Region LIKE '_____' AND TotalAmount > 5000; (8 underscores) *(1 mark each)*	**3**
Section D (2 x 4 = 8 Marks)		
33.	**Solution:** Python program to count occurrences in a list: nums = [4, 5, 6, 4, 5, 4] freq = {} for num in nums: freq[num] = freq.get(num, 0) + 1 print(freq) Output: {4: 3, 5: 2, 6: 1} *(4 marks for this program or any other correct logic)*	**4**

34.	Solution:
	(i) Create Stock table:
	CREATE TABLE Stock (
	  Stock_ID INT PRIMARY KEY,
	  Stock_Name VARCHAR(50),
	  Stock_Type VARCHAR(30),
	  Quantity INT,
	  Price FLOAT
	);
	(ii) Add new column:
	ALTER TABLE Stock ADD Supplier_Name VARCHAR(50);
	(iii) Delete Price column:
	ALTER TABLE Stock DROP COLUMN Price;
	(iv) Primary Key:
	Stock_ID must be the primary key as it uniquely identifies each record.
	(1 mark each)
		4

Section E (3 x 5 = 15 Marks)		
35.	Solution: Components of a Computer System: CPU, Memory, Input, Output devices, and Storage. Classification of devices: Input: Microphone, Graphics Tablet, Touchscreen Output: Speaker, External Storage Device *(3 marks for explanation with diagram + 2 marks for classification)*	5

36.	Solution:
	(A)
	Convert while loop to for loop:
	for i in range(10, -1, -2):
	  print(i)
	Convert for loop to while loop:
	L = [10, 20, 30, 40, 50]
	i = 0
	while i < len(L):
	  print(L[i])
	  i += 1
	(2.5 marks for correct conversion for each)
	OR
	(B) Income Tax Calculation:
	python
	Copy code
	income = int(input("Enter your income: "))
	if income <= 250000:
	  tax = 0
	elif income <= 500000:
	  tax = (income - 250000) * 0.05
	elif income <= 1000000:
	  tax = (income - 500000) * 0.1 + 2500
	else:
	  tax = (income - 1000000) * 0.2 + 12500
	print("Tax:", tax)
	(5 marks for correct logic and implementation)
		5

37.	**(i)** Insert new event: INSERT INTO Events VALUES (806, 'Science Exhibition', '2024-07-15', 'Science Block', 120, 'Dr. Kavita Singh'); **(ii)** Update participants for "Dance Performance": UPDATE Events SET Participants = Participants + 10 WHERE Prg_Name = 'Dance Performance'; **(iii)** Delete record for "Poetry Recitation": DELETE FROM Events WHERE Prg_Name = 'Poetry Recitation'; **(iv)** Update location for "Folk Dance Festival": UPDATE Events SET Location = 'Cultural Stage' WHERE Prg_Name = 'Folk Dance Festival'; **(v)** List programs scheduled between March 1, 2024, and June 1, 2024: SELECT * FROM Events WHERE Date BETWEEN '2024-03-01' AND '2024-06-01'; *(1 mark each)*	**5**

KENDRIYA VIDYALAYA SANGATHAN
UNSOLVED QUESTION PAPER - 01
CLASS XI - INFORMATICS PRACTICES (065)

Time allowed: 3 Hours **Maximum Marks:70**

Q No.	Section-A (21 x 1 = 21 Marks)	Marks
1	Identify the software among the following. (A) Monitor (B) Keyboard (C) Windows (D) Speaker	1
2	The full form of CPU is- (A) Control Processor Unit (B) Central Procedural Unit (C) Central Precision Unit (D) Central Processing Unit	1
3	The _____ is a volatile memory in computers. (A) RAM (B) ROM (C) DVD (D) Hard Disk	1
4	Which of the following is NOT a feature of Python programming language? (A) Open-source (B) Interpreted (C) Case-insensitive (D) Uses indentation	1
5	Identify the arithmetic operator in python from the following- (A) % (B) = (C) is (D) <	1
6	Which character is used to write comments in python? (A) @ (B) ! (C) # (D) $	1
7	When this python code will execute, then which output will come? import numpy as np L1=[1,2] L2=[3,4] arr = np.array([L1, L2]) print(arr[1, 0]) (A) 1 (B) 2 (C) 3 (D) 4	1
8	Which keyword is used for accepting data from a user? (A) accept (B) read (C) print (D) input	1
9	The default separator in the print statement is _____ (A) (comma) (B) (single quote) (C) (space) (D) (newline)	1
10	Which operator has the highest precedence among the following? (A) % (B) and (C) < (D) =	1
11	Which line number in the following program will give an error? 1 a, b, c = 2, 5, 'hello' 2 if a > b or c : 3 print('mmm') 4 else: 5 print('nnn') 6 elif b==a: 7 print('ooo') (A) 1 (B) 2 (C) 6 (D) No error in the program	1

13	The FROM clause in SQL is used to- (A) specify what table we are selecting the data (B) specify the columns that we want to be displayed (C) specify search condition (D) remove repeating values from being displayed	1
14	Which SQL statement is used to change the data in a table of a database? (A) SAVE (B) UPDATE (C) SAVE AS (D) MODIFY	1
15	The SQL query to find the details of all the cities whose humidity is in the range of 63 to 79 (including both 63 and 79) is- (A) SELECT * FROM weather WHERE humidity IN (63 to 79) (B) SELECT * FROM weather WHERE humidity NOT IN (63 AND 79) (C) SELECT * FROM weather WHERE humidity BETWEEN 63 AND 79 (D) SELECT * FROM weather WHERE humidity NOT BETWEEN 63 AND 79	1
16	The SQL ALTER statement is used to- (A) change the table data. (B) change the table structure. (C) delete rows from the table. (D) add rows to the table.	1
17	The command to eliminate a table from a database is- (A) DROP TABLE CUSTOMER; (B) DELETE TABLE CUSTOMER; (C) REMOVE TABLE CUSTOMER; (D) UPDATE TABLE CUSTOMER;	1
18	Which of the following query is correct for using comparison operators in SQL? A. SELECT name, course_name FROM student WHERE age>50 and <80; B. SELECT name, course_name FROM student WHERE age>50 and age <80; C. SELECT name, course_name FROM student WHERE age>50 and WHERE age<80; D. None of these	1
19	*CREATE TABLE employee (name VARCHAR(10), id INTEGER);* What type of statement is this? (A) DML (B) DDL (C) View (D) Integrity constraint	1
	Q-20,21 are Assertion (A) and Reason (R) Type questions. Choose the correct option as: (A) **Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A)** (B) **Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A)** (C) **Assertion (A) is True, but Reason (R) is False** (D) **Assertion (A) is False, but Reason (R) is True**	
20	**Assertion (A):** List and Dictionary are mutable data types in python. **Reason (R):** In both list and dictionary we can add, delete and update the elements in place	1
21	**Assertion (A):** In SQL, **INSERT INTO** is a Data Definition Language (DDL) Command.	1

	Reason (R): DDL commands are used to create, modify, or remove database structures, such as tables.		
QNo.	**Section-B (7 x 2 = 14 Marks)**		**Marks**
22	(A)	What is the difference between RAM and ROM? **OR**	2
	(B)	What is the difference between Primary Memory and Secondary Memory?	
23	Rahul, a beginner in the field of Computer Science wants to know about the different types of software. Explain to him the advantages and disadvantages of Proprietary software?		2
24	Explain the if-elif-else statement in Python using appropriate code example.		2
25	(A)	Given a list L=[1,2,3,4] and an ndarray N having elements [1 2 3 4] . What will be the result produced by the following statements? (a) L*2 (b) N*3 (c) L+L (d) N+N **OR**	2
	(B)	Find the output L=[10, 11, 12, 13, 14] x=L.pop(2) L.insert(0, x – 5) L.append(2) L.sort(reverse=True) print(L)	
26	Student just started learning Databases and is confused about the Primary Key concept. Explain the term Primary Key in a database. Tell how it is different from a Candidate Key.		2
27	Write MySQL command to create the Table 'LIBRARY' with given constraints. Table: LIBRARY		2

COLUMN NAME	DATA TYPE(SIZE)	CONSTRAINT
BookId	Int	Primary Key
BookName	Varchar(40)	Not Null
Type	Char(4)	
Author	Varchar(40)	
No_Copies	Int	

		Price | Decimal(5,2)	
28	(A) (B)	Explain Blockchain **OR** Explain Grid Computing	2
QNo	**Section-C (4 x 3 = 12 Marks)**		**Marks**
29	Draw and explain the block diagram of a computer. and write the name of Two Input and Output devices.		2+1=3
30	(A) (B)	Phuntsok has started his coding lessons in Python. Help him to write a program to accept the sales made in a shop and calculate the percentage of discount as per the following table: **OR** Sonam, a software trainee has been assigned a task to write a program that accepts the percentage of a student and then gives the result of the student as per the following table. Help her in accomplishing this task	3
31	Gulshifa is working on a database project for a company employing many salespeople. She is working on the following table SALES. Help her to answer the questions that follow: (a) Suggest the Primary key for the table giving appropriate reasons. (b) Write the SQL command to insert the following data in the table:		3

Sr.No	Sales	Discount
1	< 1000	No discount
2	Between 1000 and 5000	5%
3	More than 5000	10%

Display the discount percentage as well as the final discounted price to be paid.

Percentage	Result
More than 75 percent	First Class
60 to 75 percent	Second Class
40 to 60 percent	Pass Class
Less than 40 percent	Fail

Table : Sales

id	Name	City	Commission
E001	Naman Batra	Chandigarh	20
E002	Rupesh Mann	Delhi	15
E005	Ravi Gautam	Mumbai	25
E006	Mukul Singh	Delhi	30
E007	Ruby Rai	Mumbai	19
E003	Raman Roy	Kolkata	16

	Salesid - E009, Name-Sukumar, City-Nagpur, Commission-10 (c) Is the command used in part (b) a DDL or a DML command		
32	(A) (B)	What is Big Data? Explain any four features of Big Data. **OR** What is Cloud Computing? Explain any two services offered on the cloud.	3
Q No.	**Section-D (2 x 4 = 8 Marks)**		**Marks**
33	Write a program to accept the name of an item and its price repeatedly from the user and use it to create a dictionary. The key is the item name and the value is the price of the item. Ask the user for an item name and then find its price		4
34	(A)	Consider the following table BOOK and answer the questions that follow: Table: **BOOK**	4

BCODE	TITLE	AUTHOR	PRICE
B001	MIDNIGHT'S CHILDREN	SALMAN RUSHDIE	500
B002	THE GOD OF SMALL THINGS	ARUNDHATI ROY	450
B003	A SUITABLE BOY	VIKRAM SETH	600
B004	THE WHITE TIGER	ARAVIND ADIGA	399
B005	TRAIN TO PAKISTAN	KHUSHWANT SINGH	350

Write SQL query to-

(a) Display book titles and the author names.

(b) Display the book titles priced more than 400.

(c) Display the details of books written by ARUNDHATI ROY and KHUSHWANT SINGH.

(d) Remove the book 'THE WHITE TIGER' from the table.

OR

(B) Consider following table MEDICINE and answer the questions that follow:

Table: **MEDICINE**

MID	MED_NAME	SUPP_CITY	STOCK	DEL_DATE
M01	PARACETAMOL	MUMBAI	200	2023-06-15
M02	AMOXICILLIN	KOLKATA	50	2022-03-21
M03	COUGH SYRUP	BENGALURU	120	2023-02-10
M04	INSULIN	CHENNAI	135	2023-01-25
M05	IBUPROFEN	HMEDABAD	30	2022-04-05

Write SQL queries to-

(a) Display the Medicine names and the supplier cities of all medicines

(b) Display the medicine names from Mumbai and Chennai cities.

(c) Display the medicine names delivered in 2022

(d) To remove the medicine 'INSULIN' from the table.

Q No.	Section-E (3 x 5 = 15 Marks)	Marks

35 Rafael is working on a project monitoring the sales of a Company and is working on the table SALES as shown below: **5**

Table : Sales

id	Name	City	Commission
E001	Naman Batra	Chandigarh	20
E002	Rupesh Mann	Delhi	15
E005	Ravi Gautam	Mumbai	25
E006	Mukul Singh	Delhi	30
E007	Ruby Rai	Mumbai	19
E003	Raman Roy	Kolkata	16

Assist him by writing the output of the following SQL queries:

(A) select distinct City from Sales;

(B) Select Name, Commission * 0.5 As NewCommission from Sales;

(C) Select * from Sales where (City ='Delhi' or City = 'Mumbai') and Commission>20;

(D) Select Name, City from Sales where Commission between 20 and 30;

(E) Select Name from Sales where City != 'Delhi' and City !='Kolkata';

36 Simran is working with a media company and is analysing the performance of Movies. She is working on the table MOVIE shown below. **5**

MovieID	Title	Year	Rating
1	LAGAAN	2001	7.8
2	TAARE ZAMEEN PAR	2007	8.5
3	3 IDIOTS	2009	9.4
4	DANGAL	2016	8.9
5	ANDHADHUN	2018	7.3

Help her to write SQL statement to:

	(A)	Display the details of movies released after 2010**.** (B) Display titles and the ratings of all the movies. (C) Display the movie name and the year of release of movies having ratings in the range of 7.1 to 8.9 (inclusive of both) (D) Add a new column named **'Revenue'** which will store the revenue earned by that movie till date. (E) Remove all movies released prior to 2005 from the table.	
37	(A) (B)	Write a program that will manage the inventory of a shop. The program should create a dictionary consisting of five products from user input in which the key is the product name and the value is the quantity presently in stock. The user must input the product name and the quantity separately, the program must add it dynamically to the dictionary. The program should then ask from the user a list containing five numbers. The list of numbers are the quantities that are to be reduced from the stock. The program should reduce the quantities from the dictionary and then display the updated dictionary **OR** Write a program that creates a dictionary dynamically from user input of five product names and the corresponding price of the product. The product name is the key and the price becomes the value of the dictionary. The program should then accept a list of five integers which consist of the number of items bought for the five products in the dictionary. The program should then find the total amount of the bill by referring the dictionary created in the previous step above.	5

KENDRIYA VIDYALAYA SANGATHAN
UNSOLVED QUESTION PAPER - 02
CLASS XI - INFORMATICS PRACTICES (065)

Time allowed: 3 Hours **Maximum Marks:70**

Q No	Section-A (21 x 1 = 21 Marks)	Marks
1	State whether the following statement is True or False: Python Keywords are also known as Identifiers.	1
2	IGB = _____ Bytes (A) 2^{10} (B) 2^{20} (C) 2^{30} (D)1024	1
3	SQL stands for: (A) Standard Query Language (B) Scripting Query Language (C) Simple Query Language (D) Structured Query Language	1
4	How many times "Entry" will print on screen after execution of given code: for x in range (3,9,3): print("Entry") (A) 2 times (B) 3 times (C) 9 times (D) ERROR	1
5	Which among the following is an example for Language Processors (A) Compiler (B) Assembler (C) Interpreter (D)All the Above	1
6	What will be the output of the following code? list1=[1,3] list2=list1 list1[0]=4 print(list2) (A) [1,3] (B) [4,3] (C) [1,4] (D) [1,3,4]	1
7	Evaluate: not(1==1 and 0!=1) (A) True (B) False (C)Error (D)Cannot say	1
8	Rows of a relation are known as the _____. (A) Degree (B) Tuples (C) Entity (D) Attribute	1
9	Which of the following is correct with respect to above Python code? d={"a":3,"b":7} (A) dictionary d is created (B) a and b are the keys of dictionary d. (C) 3 and 7 are the values of dictionary (D) All of the above.	1
10	**Siri** is an example for (A) Natural Language Processing (B) Computer Vision (C) Data Science (D) Virtual Reality.	1

11	Fill in the Blank A candidate key that is not a primary key is called ---------- (A) Super Key (B) Alternate Key (C) Foreign Key (D) Secondary Key	1
12	In IoT , T stands for (A) Technology (B) Traffic (C) Things (D) Technique	1
13	Identify the odd one from the following : (A) Oracle (B) MySQL (C) MS Access (D) P y t h o n	1
14	Which among the following is an example for customized software (A) Photoshop (B) MS Excel (C) Windows (D) Hospital Management Software	1
15	Which one of the following attribute can be taken as a primary key? (A) Name (B) Designation (C) EmpId (D) Department	1
16	Which one of these is not an area of AI? (A) Face/Image Recognition (B) Voice Recognition (C) Robotics (D) Web Designing	1
17	SELECT * statement displays all ---------- of a table. (A) Rows (B) Attributes (C) Tuples (D) Domain values	1
18	Identify the data type of T: T = {1:'Anu',2:'Bineesh',3:'Chitra'} (A) List (B) Tuple (C) Dictionary (D) String	1
19	Which of the following identifier names are invalid and why? (A) Serialno1 (B) TotalMarks (C) _Percentage (D) True	1
	Q-20 and Q-21 are Assertion (A) and Reason (R) Type questions. Choose the correct option as:	
	(A) **Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A)** (B) **Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A)** (C) **Assertion (A) is True, but Reason (R) is False** (D) **Assertion (A) is False, but Reason (R) is True**	
20	**Assertion (A):** List is mutable data type **Reason (R):** We can update the values of list elements likeLl[1]=5.	1
21	**Assertion (A):** In SQL, **INSERT INTO** is a Data Definition Language (DDL) Command. **Reason (R):** DDL commands are used to create, modify, or remove database structures, such as tables.	1

Q No	Section-B (7 x 2 = 14 Marks)	Marks
22	(A) (i)Arrange the memory units in ascending order of storage size MB, KB, TB, GB, Byte (ii)List out any 2 Output Devices **OR** (B) Differentiate RAM and ROM (Mention any 2 points)	2
23	Consider the Table "Infant" shown below : Table : Infant ItemCode | Item | DatePurchase | UnitPrice | Discount 101 | Frock | 2016-01-23 | 700 | 10 102 | Cot | 2015-09-23 | 5000 | 25 103 | Soft Toy | 2016-06-17 | 800 | 10 104 | Baby Socks | 2014-10-16 | 100 | 7 Identify the Degree and cardinality of the table .	2
24	Adrija wants to store the details of IP students in her class. Help her to write suitable SQL queries for the following. (i) To create the database IP . (ii) Also tell her how to start working in that database.	2
25	(A) Define the following: (i) Machine Learning (ii) Blockchain technology **OR** (B) Explain Natural Language Processing . List out any two NLP applications	2
26	Define the term Primary Key in a database. Explain how it is different from a Candidate Key.	2
27	List out any 4 features of Python.	2
28	Categorize the following commands as DDL or DML: (A) DROP, DELETE, UPDATE, ALTER **OR** (B) Differentiate between char(n) and varchar(n) data types with respect to databases.	2
Q No	**Section-C (4 x 3 = 12 Marks)**	**Marks**
29	(i) Differentiate System Software and Application Software with 1 example for each. (ii) Give any 2 examples for Customized software.	**2+1**
30	A) Write a program to accept a list of numbers and replace all numbers greater than or equal to 33 with "PASS" and less than 33 with "FAIL" eg: If the accepted list is [23,45,56,29,90,33], it should be replaced as ["FAIL"," PASS"," PASS"," FAIL"," PASS"," PASS"] **OR**	**3**

B) Predict the output:

```
List1=[13,18,11,16,13,18,13]
print(List1.index(13))
print(List1.count(18))
List1[2]=10
List1.append(10)
List1.append(List1.count(10))
print(List1)
```

31 (i) Rewrite the following code in python after removing all the syntax errors. Underline each correction done in the code. **2+1=3**

```
num1, num2 = 10   5
if  num1 % num2 = 0
  num1+= 20
  num2+= 30
Else:
  print(Not Divisible )
```

(ii) Give 2 examples for Immutable datatypes in python

32 (A) Consider the following list **myList**. What will be the output of the code after executing of below code: **3**

```
myList = [10,20,30,40]
myList.append([50,60])
d=myList.pop(2)
print(d)
print(myList)
```

OR

(B) Write a program to make 1-D array and 2-D array list and write the output for both

Q No	Section-D (2 x 4 = 8 Marks)	Marks

33 i. Write an SQL query to create the table "Items" with the following structure- **4**

Field	Type	Constraint
Item_Id	Varchar(5)	Primary Key
Item_Name	Varchar(25)	
Manufacturer	Varchar(15)	
Color	Varchar(15)	
Price	Integer	
Quantity	Integer	Not Null

(ii) Write SQL Query to insert the following data in the Items Table
101, Galaxy S30 Ultra, Samsung, Black, 85000, 10

(iii) Aman has created a table "Inventory" and forgot to add a column "GST" of data type integer. Write SQL command to add the column in the table.

(iv) Smita is working on SQL query , but she is getting error in her query. Help her in removing error and writing correct query

select * from Product where price=NULL;

34 Write the output of the queries (i) to (iv) based on the table given below: **4**

TABLE: CHIPS

BRAND_NAME	FLAVOUR	PRICE	QUNATITY
LAYS	ONION	10	5
LAYS	TOMATO	20	12
UNCLE CHIPS	SPICY	12	10
UNCLE CHIPS	PUDINA	10	12
HALDIRAM	SALTY	10	20
HALDIRAM	TOMATO	25	30

I. Select BRAND_NAME, FLAVOUR from CHIPS where PRICE < > 10;
II. Select * from CHIPS where FLAVOUR="TOMATO" and PRICE > 20;
III. Select BRAND_NAME from CHIPS where price > 15 and QUANTITY < 15;
IV. Select price , price *1.5 from CHIPS where FLAVOUR = "PUDINA";

Q No	Section-E (3 x 5 = 15 Marks)	Marks

35 Write python code to create a dictionary of Products with product name as key and price as value .Product name and price must be accepted from the user . **5**

The program should then search for particular product by inputting product name and display price of the same on the screen

For Example the expected output in the following format.

Product = {'Pen' : 20, 'Book': 50 , 'Pencil' : 10 }
Enter the Product Name : Book
Product Details Found : 'Book': 50

OR

Consider the given dictionary,

D={1:'monday', 2:'Tuesday', 3:'Wednesday',4:'Thursday'}

(i) What will be the output of following code:
print(D.values())
(ii) What will be the output of D[2]
(iii) Write python code to add a new value 'Friday 'with key 5.
(iv) Write python code to remove the value 'Wednesday' from the dictionary.
(v) Which among the following statements will the number of key value pairs in D ?
(A) D.count() (B) count(D) (C) len(D) (D) D.index()

36 Mr. Manav, a database administrator in "Global Educational and Training Institute" has created following table named "Training" for the upcoming training schedule: 5

Table : Training:

Training_Id	TName	Topic	City	Fee
ND01	Mr.Renjit	Cyber Security	New Delhi	10000
CH01	Mr.Rajesh	ICT in Education	Chennai	15000
CO01	Ms.Neena	Cyber Security	Cochin	12000
MU01	Ms.Anjali	Data Analysis	Mumbai	NULL
ND02	Mr.Anand	Cyber Security	New Delhi	9000

Help him in writing SQL query for the following purpose:

i. To display details of trainings whose fees in the range 10000 - 15000.

ii. To display the topic of free trainings.

iii. To display all the cities where Cyber Security training is scheduled along with its fee.

iv. To display Trainer name , Topic and Fee of all trainings conducted in Mumbai and Chennai

v. To display the details of all trainings

37 Consider the Table "INFANT" shown below. **5**

Table: Infant

ItemCode	Item	DatePurchase	UnitPrice	Discount
101	Frock	2016-01-23	700	10
102	Cot	2015-09-23	5000	25
103	Soft Toy	2016-06-17	800	10
104	Baby Socks	2014-10-16	100	7
105	Baby Suit	2015-09-20	500	5

Write SQL commands based on the Infant table :

I. Display all the rows from infant table

II. Display the details about the Cot.

III. Display the names of items and their unitprice where the date of purchase is after 31 st December , 2015.

IV. Display the name of items whose unit price is between 100 and 1000 (including both values).

V. Delete the details of Soft Toy

OR

Write the output for the following SQL commands:

(i) SELECT DISTINCT DISCOUNT FROM INFANT;

(ii) SELECT ITEM FROM INFANT WHRE DISCOUNT BETWEEN 10 AND 30 ;

(iii) SELECT ITEM, DATEPURCHASE FROM INFANT WHERE DATEPURCHASE < '2015-01-01' ;

(iv) SELECT Item,UnitPrice FROM Infant WHERE UnitPrice<800 AND Discount>5;

(v) SELECT ItemCODE, Item FROM Infant WHERE Discount =10 or Discount=25 ;

KENDRIYA VIDYALAYA SANGATHAN
UNSOLVED QUESTION PAPER - 03
CLASS XI - INFORMATICS PRACTICES (065)

Time allowed: 3 Hours **Maximum Marks:70**

Q.No	**SECTION A (21 X 1 =21 marks)**	Marks
1	1074 ZB = _____? a) 1 YB 50ZB b) 1EB 50ZB c) 1YB 50 PB d)1PB 50 TB	1
2	A database can have only one table in MySql.State True or False	1
3	Shilpi is teaching Arithmetic operators in Python. One of her student wrote the following statement:'7'+5 Predict the output of the above mentioned statement: a) 75 b)12 c) TypeError d) 77777	1
4	Which command is used to add new record in table?	1
5	Which is not a valid operator in SQL? a) ABOVE b) IN c) LIKE d) BETWEEN	1
6	Which of the following identifiers is/are invalid? a) Data b) _Data c) Data123 d) 4_Data	1
7	Identify the selection statement among the following: a) for b) while c) if d) range	1
8	1 nibble= bits a) 2 b) 4 c) 8 d) 16	1
9	Which among the following devices has the highest storage capacity? a) RAM b) ROM c) Pendrive d) Hard Disk	1
10	Find the output produced by the following code: L=[12, 14.6, ['a','b','c'],"hello"] print(len(L)) a) 6 b) 4 c) 5 d) None of the above	1
11	Identify the correct command which will produce the output given below: [0,-2,-4,-6,-8] a)list(range(-2,-8,-2)) b) list(range(0,-8,-2)) c) list(range(-2,-10,-2)) d) list(range(0,-10,-2))	1
12	Choose the incorrect statement related to Where clause: a) It is used to filter records b) It is used to retrieve data that meet some specified conditions c) It is used with SELECT statements as well as with INSERT statements d) It is used with arithmetical as well as logical operators	1

13	Comments are executed by interpreter. State True or False	1
14	A company interested in cloud computing is looking for a provider who offers a set of basic services such as virtual server provisioning and on-demand storage that can be combined into a platform for deploying and running customized applications. What type of cloud computing model fits these requirements? a) Platform as a Service b) Software as a Service c) Infrastructure as a Service	1
15	The COUNT(*) function provides the total number of _____ within a relation (table) in a relational database. (A) Columns (B) Unique values (C)Not-null values (D)Rows	1
16	Identify the SQL command used to delete a relation (table) from a relational database. (A) DROP TABLE (B) REMOVE TABLE (C) DELETE TABLE (D)ERASE TABLE	1
17	Which is not one of the features of IoT devices? a) Remotely controllable b) Programmable c) Can turn themselves off if necessary d) None of the above	1
18	From the below python code, what should come in print command as index value so that first element of array and 35 value is displayed from the array import numpy as np Array=np.array([3,6,9,12,15,18,36,35,38]) print(Array[ ],Array[ ]) (a) [1],[7] (b) [1],[8] (c) [0],[8] (d)[0],[7]	1
19	"Imagine what if our bulbs, fans and refrigerator also become a part of LAN or Internet. Think about of the advantages and tasks that can be accomplished if all these devices with smart connectivity features are able to communicate amongst themselves and we are also able to communicate with them using computers or smart phones." In your opinion, which feature are we talking about in the above context? (i) AR (ii) VR (iii) WoT (iv) IoT	1

20	**Assertion(A)**: List is a sequence in Python **Reason (I):** Individual values in a list can be accessed using its index i. Both A and R are true and R is the correct explanation for A ii. Both A and R are true and R is not the correct explanation for A iii. A is True but R is False iv. A is False but R is True	1
21	**Assertion (A):** Random Access Memory is volatile and stores data currently in used. **Reason (I):** RAM is storage medium that retains its contents ever after the supply of electricity turned off. (A) Both A and R are true and R is the correct explanation for A (B) Both A and R are true and R is not the correct explanation for A (C) A is True but R is False (D) A is false but R is True	1

	SECTION B (7 x 2 = 14 Marks)	
22	Deleting digitally stored data means changing the details of data at bit level, which can be very time consuming. Therefore, when any data is simply deleted, its address entry is marked as free, and that much space is shown as empty to the user, without actually deleting the data. In case data gets deleted accidentally or corrupted, there arises a need to recover the data. Recovery of the data is possible only if the contents/memory space marked as deleted have not been overwritten by some other data. i) Can you recover the data once deleted? Justify ii) Give any one security threat involved when we throw away electronic gadgets that are non-functional. **Or** Write down the type of memory needed to do the following: i) To execute the program ii) To store the instructions which cannot be overwritten	2
23	How to create an Array of list in python using NumPy? Explain with suitable example.	2
24	What are DDL and DML? Give one command of each.	2
25	The Doc_name column of a table HOSPITAL is given below: Doc_Name Avinash Hariharan Vinayak Deepak Sanjeev Write the output of the following queries: i) SELECT Doc_name FROM HOSPITAL WHERE Doc_name LIKE '%v';. ii)SELECT Doc_name FROM HOSPITAL WHERE Doc_name LIKE '_e%'	2
26	Differentiate between Virtual Reality and Augmented Reality.	2
27	The following query is producing an error. Identify the error and also write the correct query. SELECT * FROM EMP ORDER BY NAME WHERE SALARY>=5000;	2
28	Consider the following table ITEM : Item_no Item_name Price 1 Pen 10 2 Pencil 5 3 Rubber 7 4 Sharpener 8 What is the degree and cardinality of the above mentioned table? **Or** Write any two advantages of using MySql?	2

	SECTION C(4 x 3 = 12 Marks)	
29	Write the most appropriate list functions to perform the following: i) To delete a value from the list ii) arrange the elements of the list in ascending order iii) to add an element in any position of a list	3
30	(i) Himank has written the following statement in Python, but it is showing an error: X = 0o81 According to you what could be the problem? (ii) "Our heritage monuments are our assets. They are a reflection of our rich and glorious past and an inspiration for our future. UNESCO has identified some of Indian Heritage sites as World Heritage Sites." Identify at least two parameters from the above text that can be used as key value pair to set up a dictionary. Form a dictionary to create at least 5 records of World Heritage Sites.	1+2 =3
31	(i) Write an SQL statement to create a table named STUDENTS, with the following specifications: Column Name: Data Type StudentID: Numeric FirstName: Varchar(20) LastName: Varchar(20) DateOfBirth: Date Percentage: Float(10,2) (ii) Write SQL Query to insert the following data in the Students Table 1, Supriya, Singh, 2010-08-18, 75.5	3
32	Consider the table "Accessories" given below and write suitable output of the following:	3

Table : ACCESSORIES

No	Name	Price	Id
A01	Mother Board	12000	S01
A02	Hard Disk	5000	S01
A03	Keyboard	500	S02
A04	Mouse	300	S01
A05	Mother Board	13000	S02
A06	Keyboard	400	S03
A07	LCD	6000	S04
T08	LCD	5500	S05
T09	Mouse	350	S05
T10	Hard Disk	4500	S03

(i) SELECT DISTINCT NAME FROM ACCESSORIES WHERE PRICE>5000;
(ii) SELECT AVG(PRICE), MAX(PRICE) FROM ACCESSORIES WHERE PRICE>=10000;
(iii) SELECT NAME, PRICE*.05 DISCOUNT FROM ACCESSORIES WHERE ID IN („S02",“S03")

SECTION D (2X4=8 Marks)

33 i) What will be the output of following code: 1+1+2=4

```
dict1 = {"Rollno":20, "Marks":65}
dict2 = {"Rollno":20, "Marks":65}
print(dict1 == dict2)
```

ii) Name different types of comments in Python.

iii) Predict the output of the following:

```
quota = ["sports", " pwd", "ews", "gen"]
Marks= [58,70,45,69]
for k in range(len(quota)):
    if quota[k]=="sports":
        Marks[k]+=2
    if quota[k]=="ews":
        Marks[k]+=5
```

34 i) Suppose there is a computer with RAM but no secondary storage. Why we are not able to install software on that computer? 1+1+2=4

ii) Why cache memory is considered crucial for microprocessor performance?

iii) Suman has discarded old, broken and malfunctioning Hard Disk without taking care to delete data. Is it harmful in respect of security concern? Justify your answer.

SECTION E (3 X 5=15 Marks)

35 Consider the table 'Transact' given below and write suitable SQL queries of the following: 5

TABLE: TRANSACT

TRNO	ANO	AMOUNT	TYPE	DOT
T001	101	2500	Withdraw	2017-12-21
T002	103	3000	Deposit	2016-06-01

T003	102	2000	Withdraw	2017-05-12
T004	103	1000	Deposit	2018-10-22
T005	102	12000	Deposit	2017-11-06

(i) To display details of all transactions of TYPE Withdraw from TRANSACT table

(ii) To display the date of transaction (DOT)along with the amount from table TRANSACT for Account having ANO as 102

(iii) To display the column values of ANO without repetition.

(iv) To increase the amount by 500 for all transactions of deposit type in the TRANSACT table.

(v) To delete the row of the transaction with TRNO T004.

36 Consider the table 'Teacher_Details' given below and write suitable SQL queries of the following: 5

Table: Teacher_Details

T_ID	T_Name	T_DOJ	T_Subject	Num_of_Periods
1001	Bharti	2018-10-15	Hindi	27
1002	Pratima	NULL	NULL	32
1003	Savitri	2012-11-13	Science	29
1004	Aashna	2020-02-24	English	28

i) Display the T_Name and Num_of_Periods by increasing the number of periods each by 1.

ii) Display T_Name of all those teachers whose date of joining is after 1st Jan 2019.

iii) Display T_ID and T_Name of all those teachers whose number of periods are in the range of 25 to 30. (both values included)

iv) Display the details of all those teachers who have not assigned any subject.

v) Display the details of all those teachers whose subject is either Hindi or Science.

37 3+2 =5

a) A data analyst wants to preprocess a list of numbers by replacing all positive numbers with 1 and negative numbers with -1. The analyst needs a Python program to accept the list from the user, modify it, and display the result.

Requirements:

1. Accept a list of numbers from the user.
2. Replace all positive numbers with 1 and negative numbers with -1.
3. Display the modified list.

Solution:

Write a Python program that meets the requirements above.

b) A statistician wants to calculate the average of a list of numbers. The statistician needs a Python program to accept the list from the user and display the average.

Requirements:

1. Accept a list of numbers from the user.
2. Calculate the average of the numbers.
3. Display the average.

Solution:

Write a Python program that meets the requirements above.

OR

a) A programmer wants to perform various operations on a list of numbers.

	The programmer needs to understand how to slice, append, and reverse lists. **Requirements:** 1. Find the output of the given code. Code: list1 = [11, 12, 13, 14, 15, 16, 17, 18, 19, 20] print(list1[::2]) print(list1 + [21, 22]) print(list1[::-]) b) A data analyst wants to understand nested lists to store complex data. **Requirements:** Define what a nested list is. Provide an example of a nested list.	

Web links:

1. Syllabus for Higher Secondary Stage prescribed by NCERT:

https://ncert.nic.in/pdf/syllabus/IPHSS.pdf

2. CBSE Syllabus Class XI – IP (065) Session 2025-2026

https://cbseacademic.nic.in/web_material/CurriculumMain26/SrSec/Informatics_Practices_SrSec_2025-26.pdf

3. NCERT Publication Book for IP (Class XI)

https://ncert.nic.in/textbook.php?keip1=0-8

4. Digital Text Book Class XI- IP on Diksha Portal

https://diksha.gov.in/resources/play/collection/do_31303353249855078417 85?contentType=TextBook

5. Study Material Contain images taken from Open Source like ChatGpt and Gemini using AI