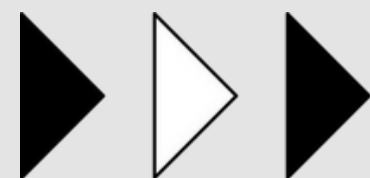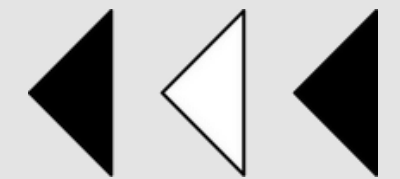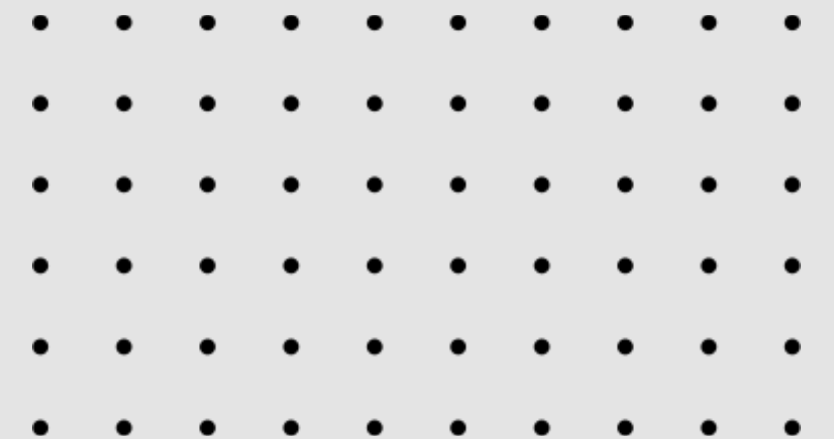# Number Systems

Presented by John Paul E. Tautuan
BSIT - 1

Portfolio #3

Table of Contents
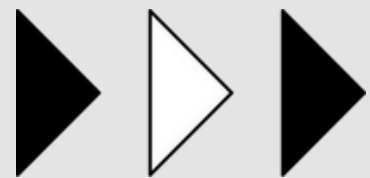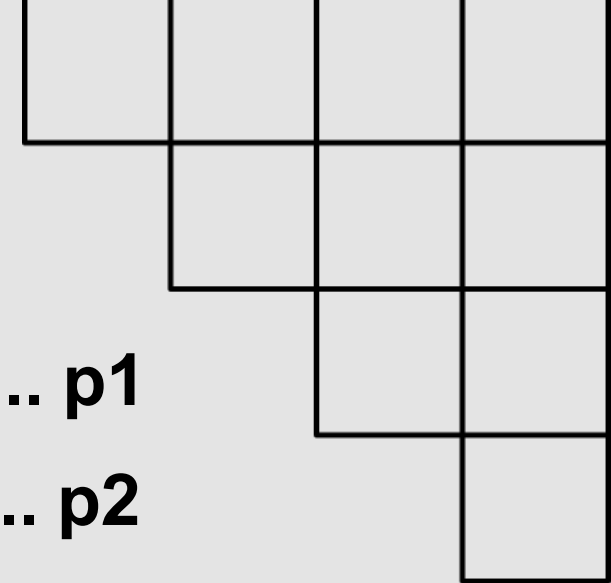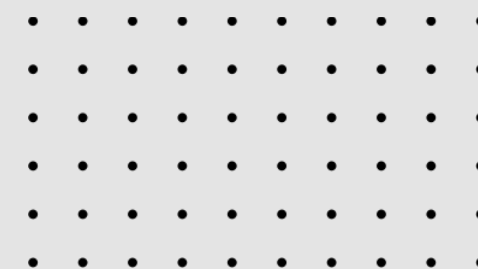
What is a Number System?

A number system is a structured method for expressing and interpreting numerical values using a set of symbols and rules. It provides a standardized way to represent quantities, perform calculations, and communicate numeric information. Different number systems, such as decimal, binary, octal, and hexadecimal, are used for various purposes in mathematics, computing, and digital systems.

Types of Number Systems

Decimal (Base-10)

The decimal system uses digits 0–9 and is the standard number system for everyday counting, measurement, and arithmetic.

Octal (Base-8)

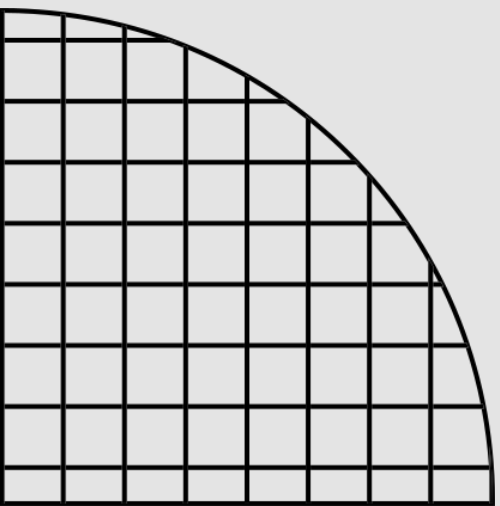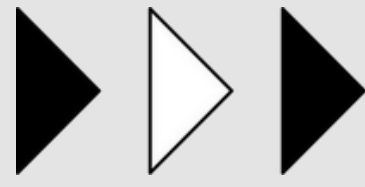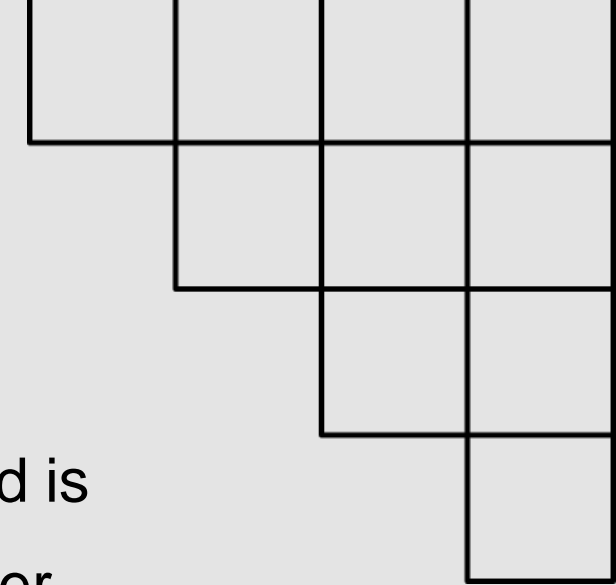The octal system uses digits 0–7 and is mainly used in computing as a shorter, more readable representation of long binary values.

Binary (Base-2)

Binary uses only two digits, 0 and 1, and is the fundamental language of computers because it aligns with electrical on/off states.

Hexadecimal (Base-16)

Hexadecimal uses digits 0–9 and letters A–F to represent values and is commonly used in programming, memory addressing, and digital graphics because it condenses binary into a compact form.

Analysis

Number systems are fundamental frameworks used to represent, process, and interpret numerical values in both human and computer contexts. These number systems serve as the symbolic language through which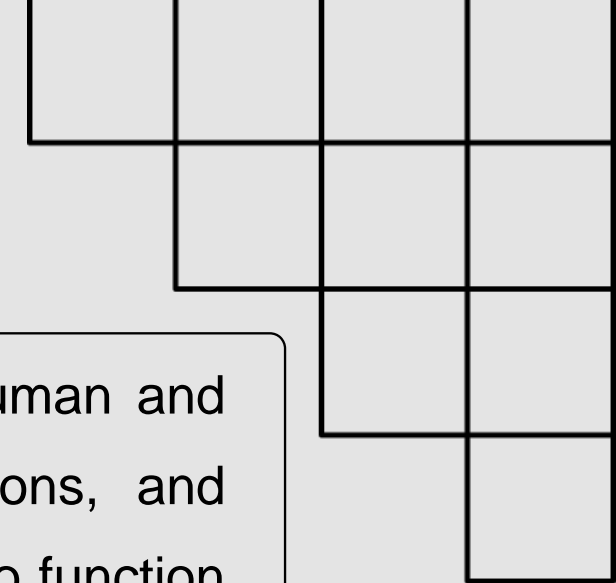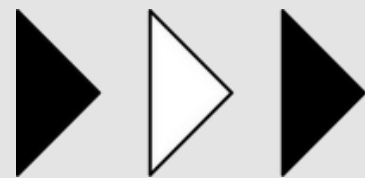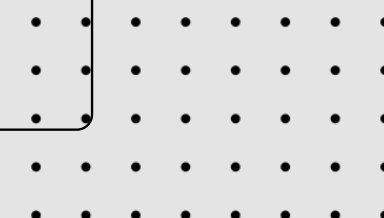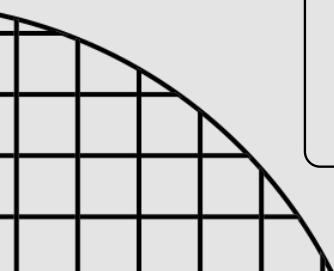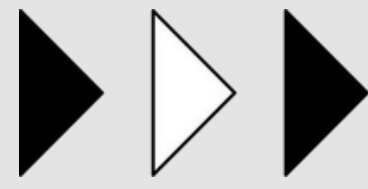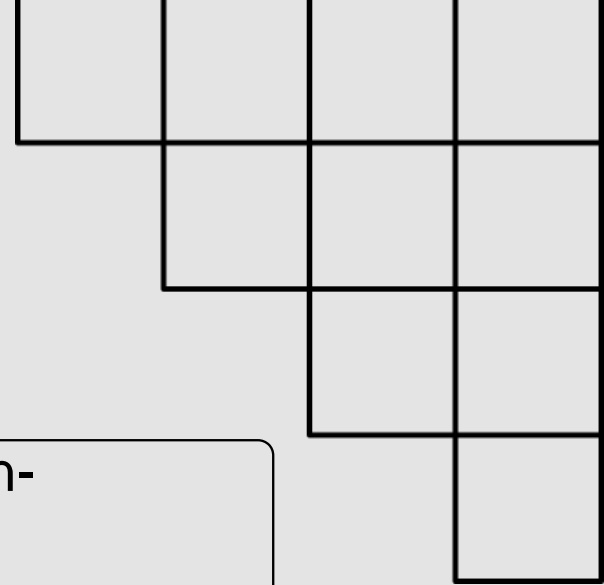 quantities, operations, and computational instructions are expressed. Much like how information systems rely on raw data and refined information to function coherently, number systems enable the conversion, manipulation, and transmission of numerical data in forms that can be understood by different tools, machines, or individuals. To appreciate their significance, it is necessary to distinguish the various types of number systems and examine their respective uses. The Decimal Number System, also known as base 10, is the most familiar and widely used system in daily life. Its significance lies in its universality and ease of interpretation, allowing it to function as the standard for human-oriented calculations, financial transactions, measurements, and academic instruction. The Binary Number System (base 2), composed solely of 0s and 1s, is indispensable in computing. Since digital devices operate using electrical signals that can only represent two states on or off, binary enables machines to store, process, and transmit data efficiently.The Octal (base 8) and the Hexadecimal (base 16) systems serve more specialized roles in computer science. Octal is often used as a shorthand for binary because its base aligns neatly with groups of three binary digits, simplifying error detection and memory address organization. Hexadecimal, on the other hand, condenses long binary sequences into more readable groups of four, allowing programmers, engineers, and system administrators to manage memory addresses, color codes, machine instructions, and debugging processes with greater clarity. Together, these number systems form an interconnected structure that mirrors the relationship between data and information in an information system. Each system plays a critical role, whether facilitating human comprehension, optimizing machine performance, or bridging complex digital operations.
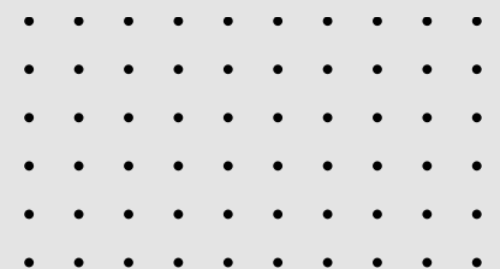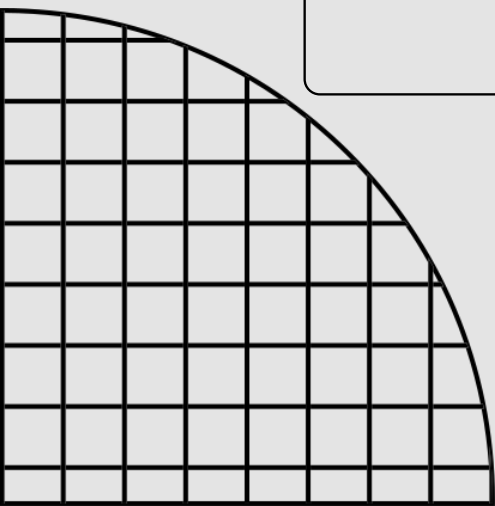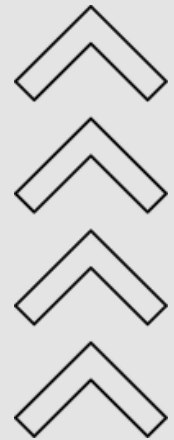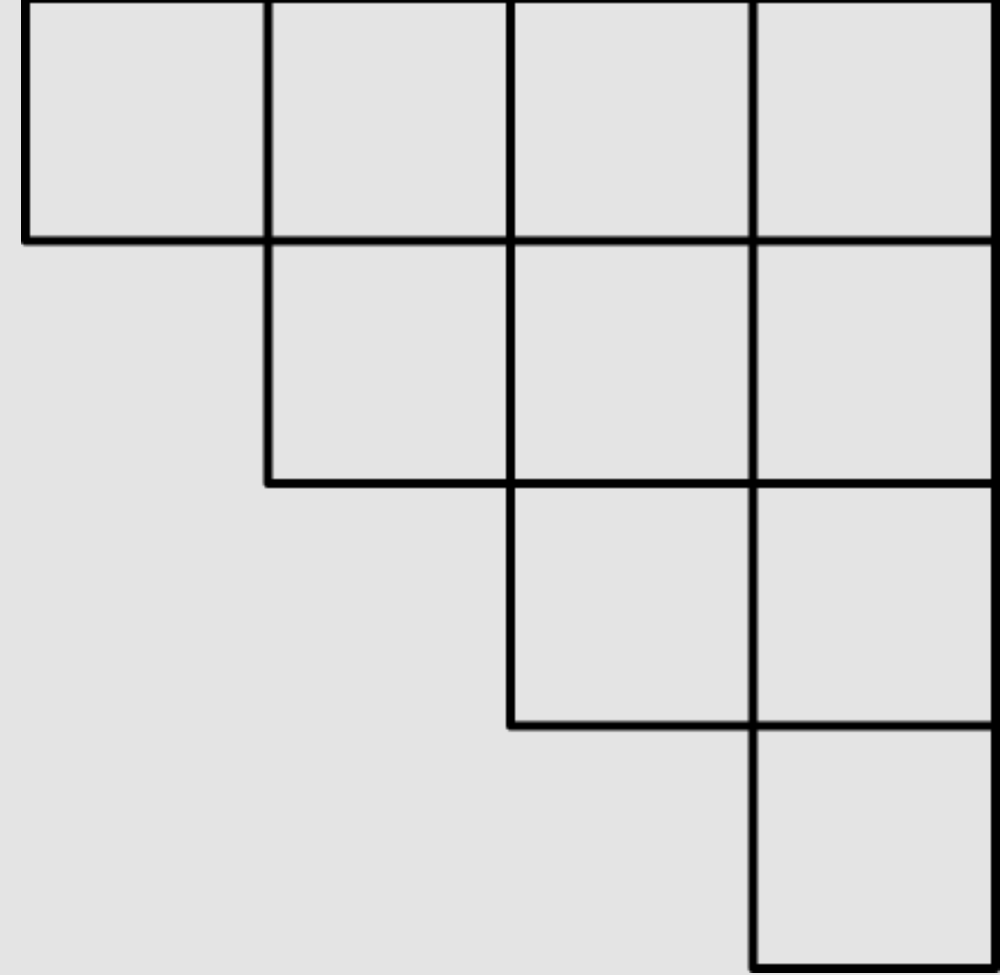
References

- GeeksforGeeks. (n.d.). Number Systems in Computer Science. https://www.geeksforgeeks.org/number-system-in-computer-science/
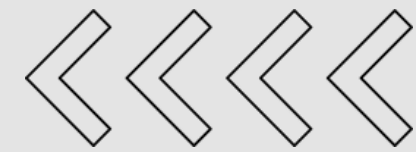
- TutorialsPoint. (n.d.). Number Systems. https://www.tutorialspoint.com/computer_logical_organization/number_systems.htm

- Khan Academy. (n.d.). Number Systems and Bases. https://www.khanacademy.org/math/pre-algebra/pre-algebra-exponents-radicals/pre-algebra-bases-intro

- IBM Documentation. (n.d.). Understanding Binary, Octal, and Hexadecimal. https://www.ibm.com/docs/en

- Computer Science Field Guide (University of Canterbury). (n.d.). Number Systems. https://www.csfieldguide.org.nz/en/chapters/data-representation/

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Thank You

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