NUMBER SYSTEMS

WHAT ARE NUMBER SYSTEMS?

A number system is a mathematical notation used to represent numbers in a consistent manner. It defines a set of symbols and the rules for combining those symbols to represent quantities. In digital systems, number systems play a critical role, as they are used in computers and digital electronics to represent data. Number systems can be categorized based on the base or radix, which is the total number of unique digits used in the system. For example, the decimal system has a base of 10, meaning it uses 10 digits (0–9).

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TYPES OF NUMBER SYSTEMS

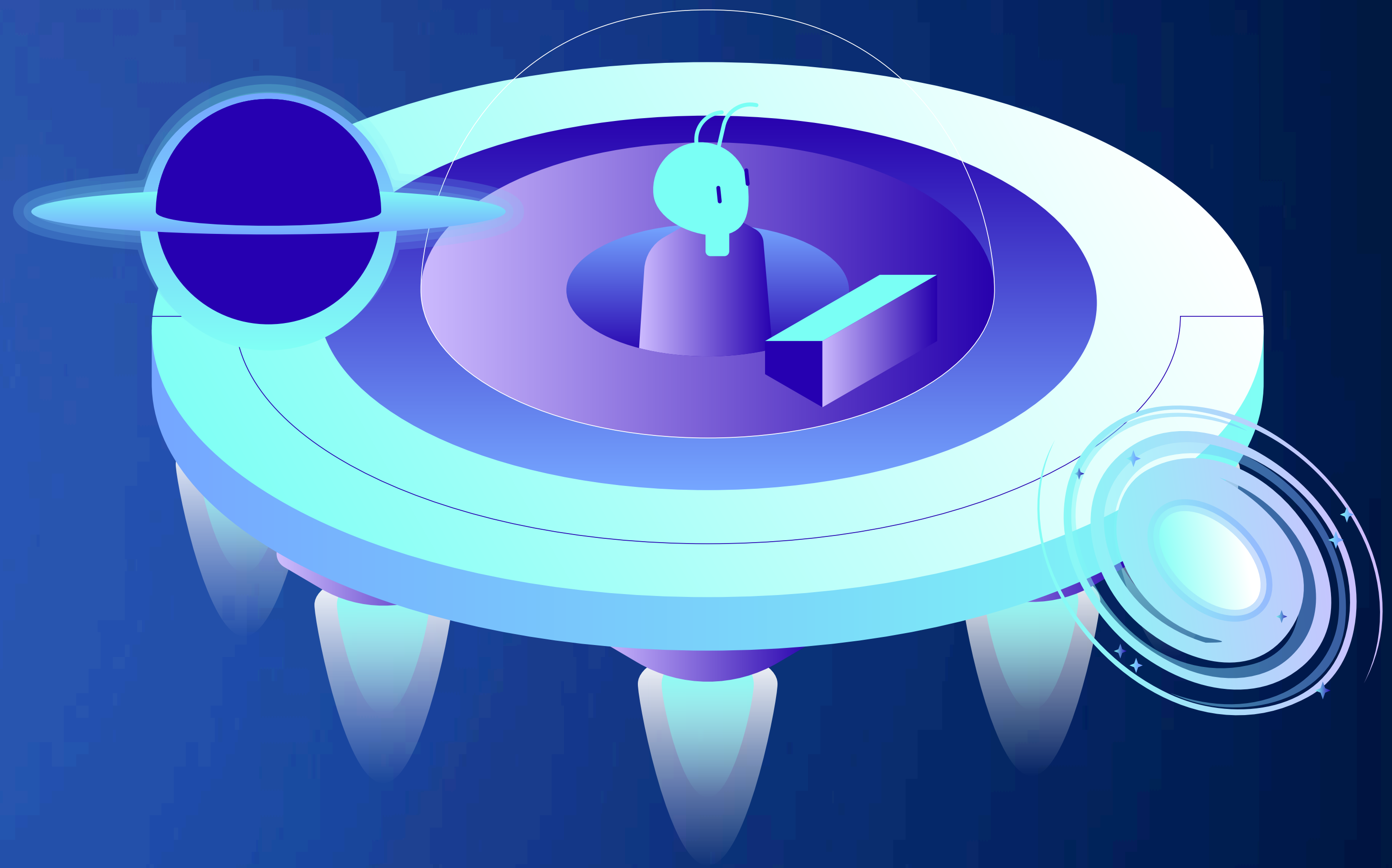
1. Decimal Number System (Base 10)
2. Binary Number System (Base 2)
3. Octal Number System (Base 8)
4. Hexadecimal Number System (Base 16)

DECIMAL NUMBER SYSTEM (BASE 10)

Digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

Base: 10

Common Representation: This is the most familiar number system, used in everyday arithmetic.

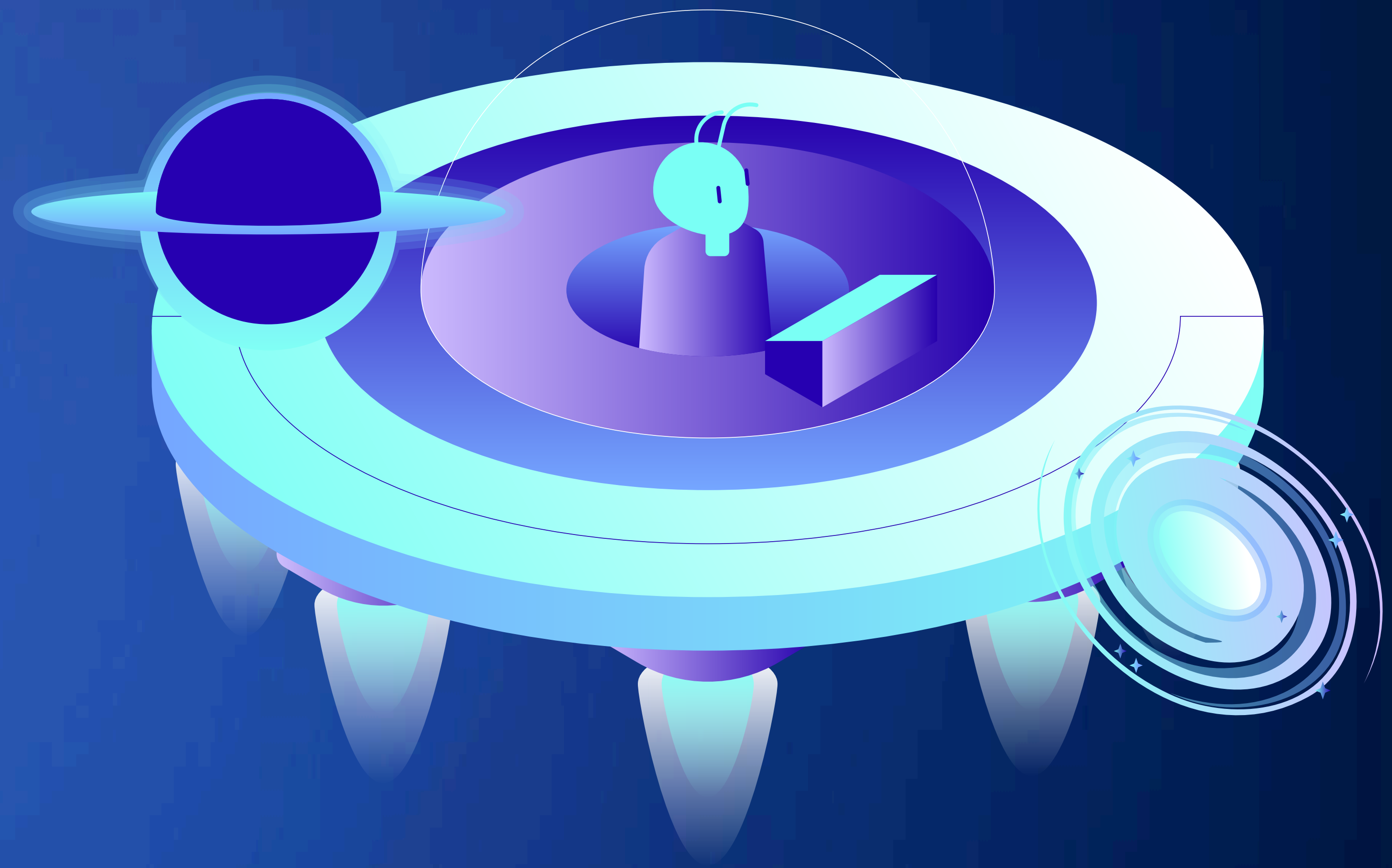


BINARY NUMBER SYSTEM (BASE 2)

Digits: 0, 1

Base: 2

Common Representation: This system is used in digital computing and electronics.

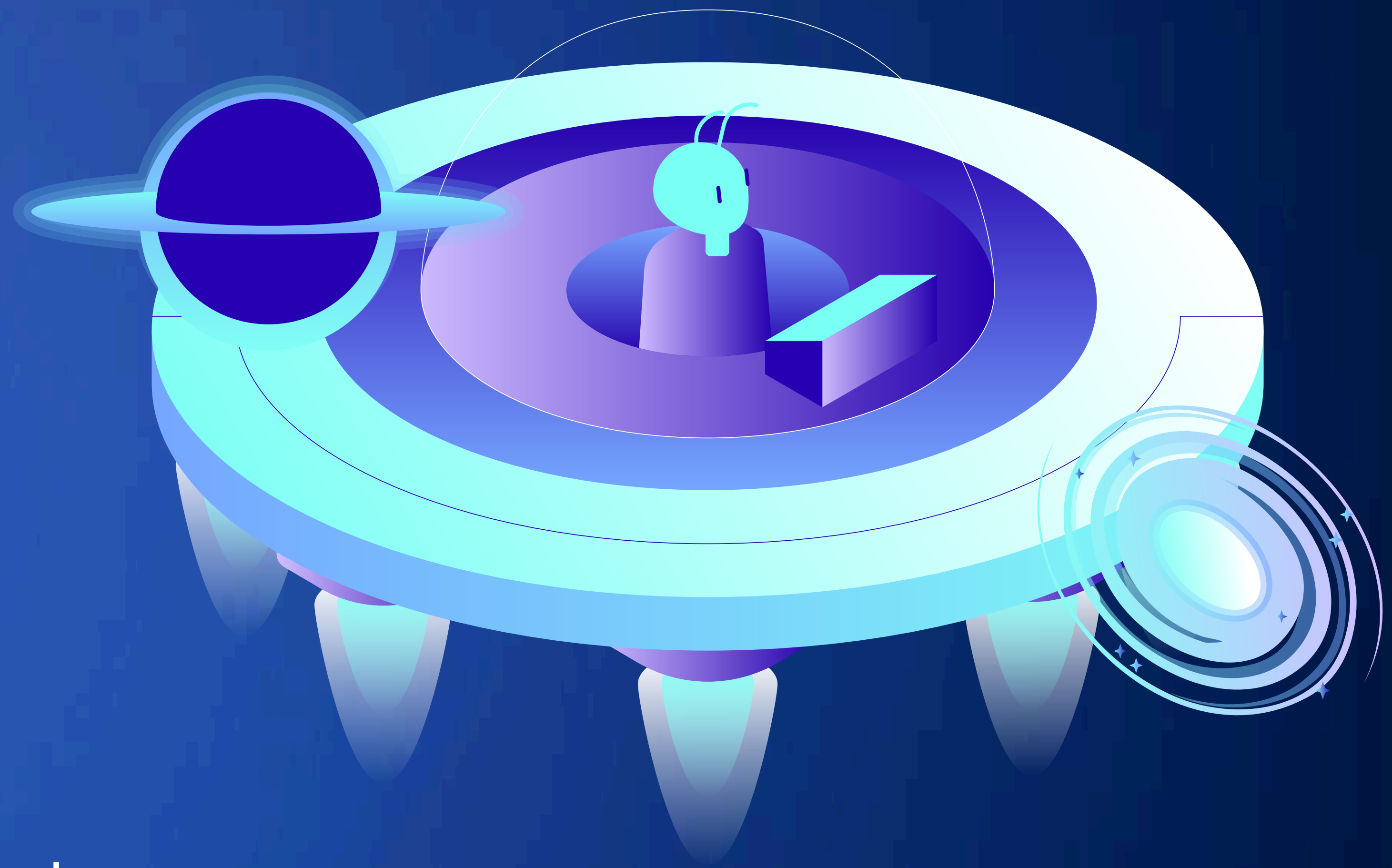


OCTAL NUMBER SYSTEM (BASE 8)

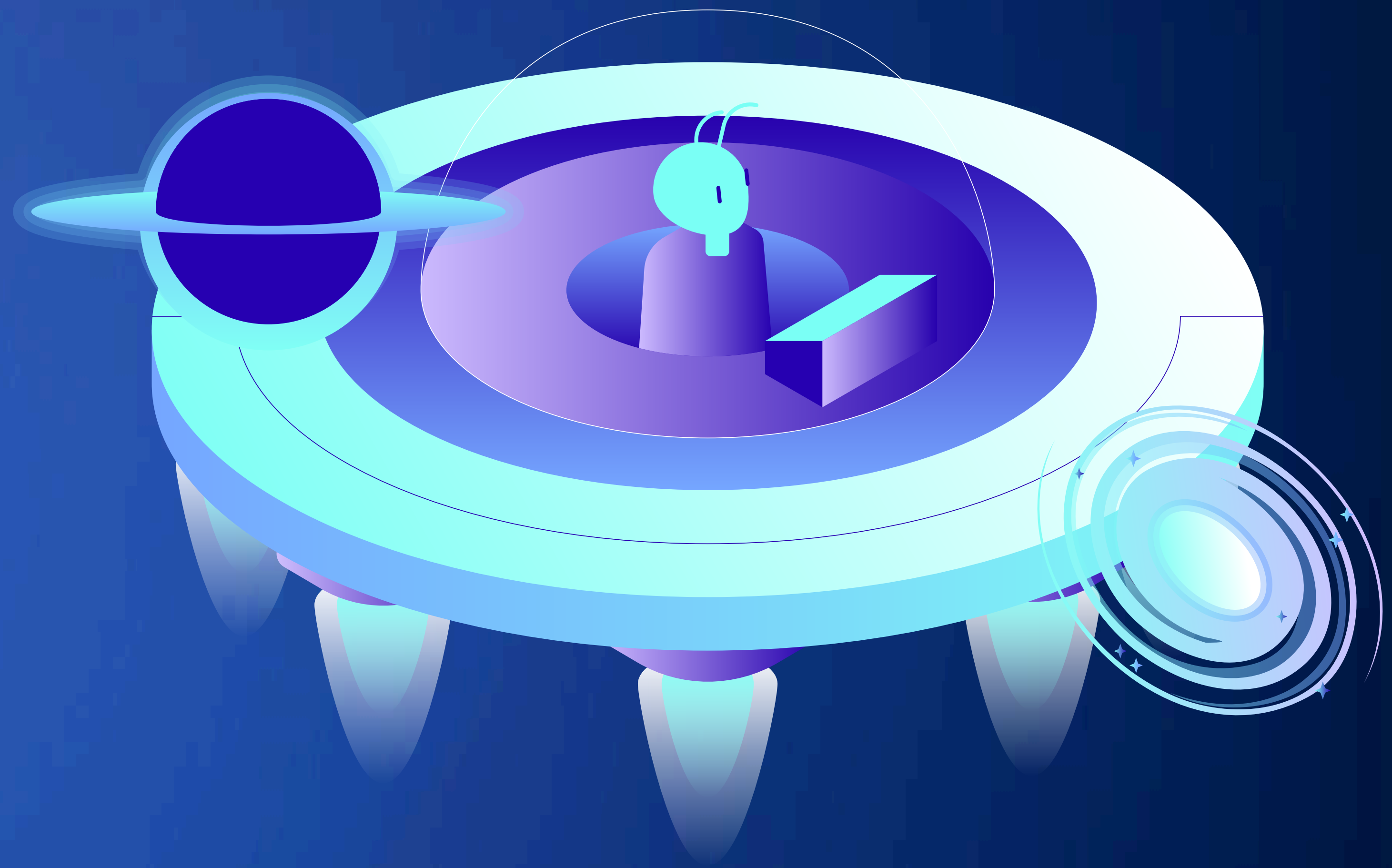
Digits: 0, 1, 2, 3, 4, 5, 6, 7

Base: 8

Common Representation: This system was historically used in early computing systems but is less common today.



HEXADECIMAL NUMBER SYSTEM (BASE 16)



Digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F

Base: 16

Common Representation: Used in computing, particularly in programming and memory addressing.

Note: The letters A and so on represent the numbers following after 9. So: A = 10, B = 11, C = 12, etc.

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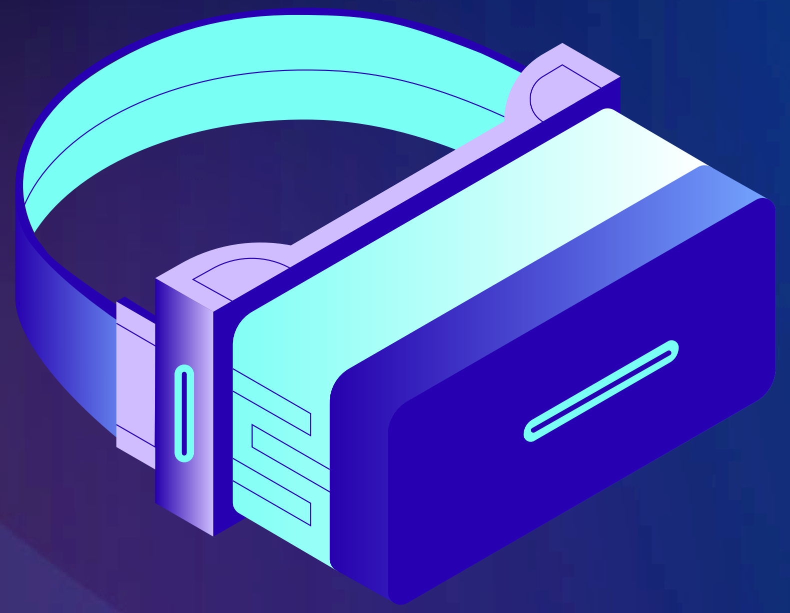
USES/SIGNIFICANCE OF EACH NUMBER SYSTEM



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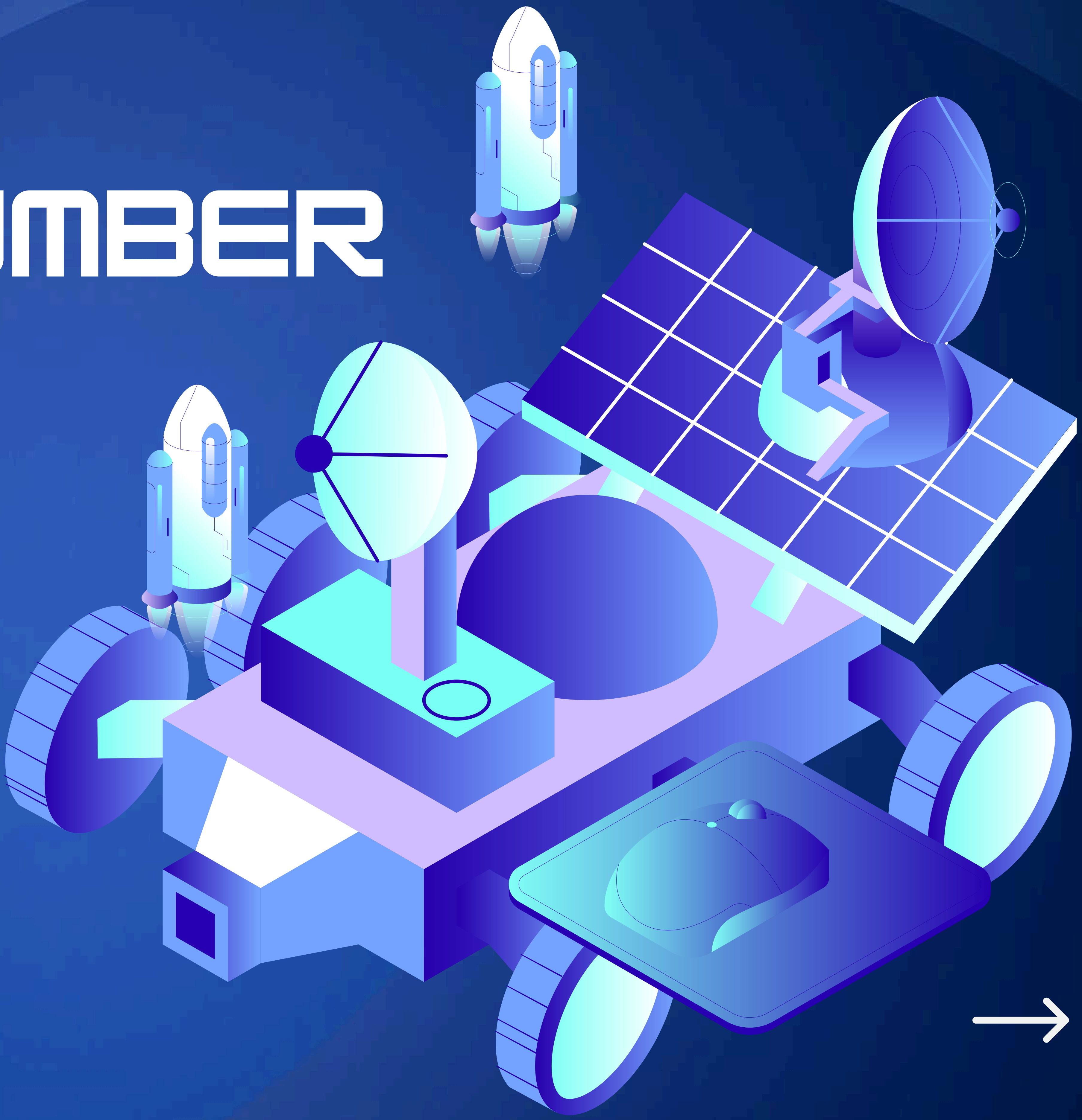
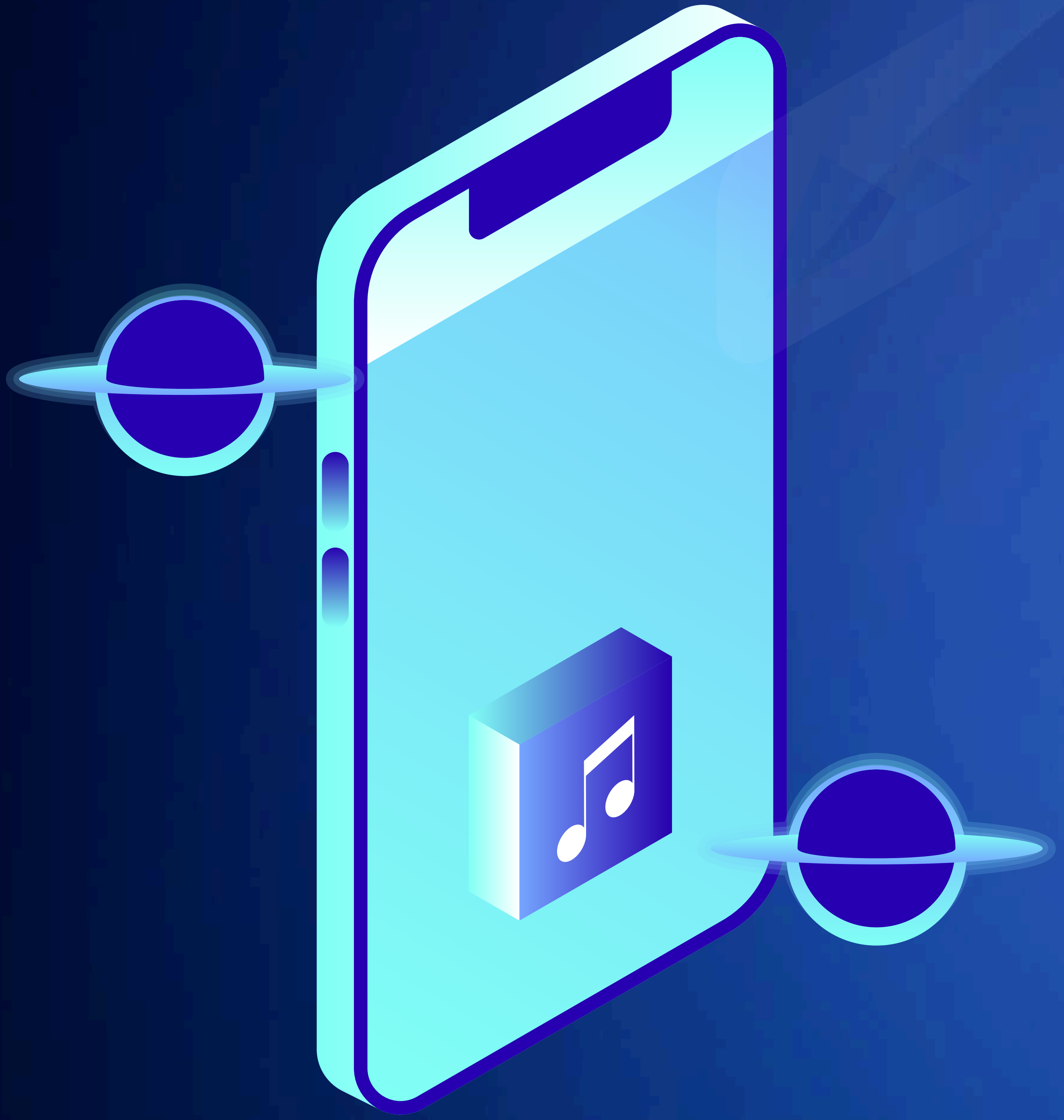
DECIMAL NUMBER SYSTEM

- **Uses:** The decimal system is the most commonly used number system in everyday life. It is used in financial calculations, science, and engineering.

- **Significance:** Since it mirrors how humans naturally count and calculate, the decimal system is the most intuitive for people.





BINARY NUMBER SYSTEM

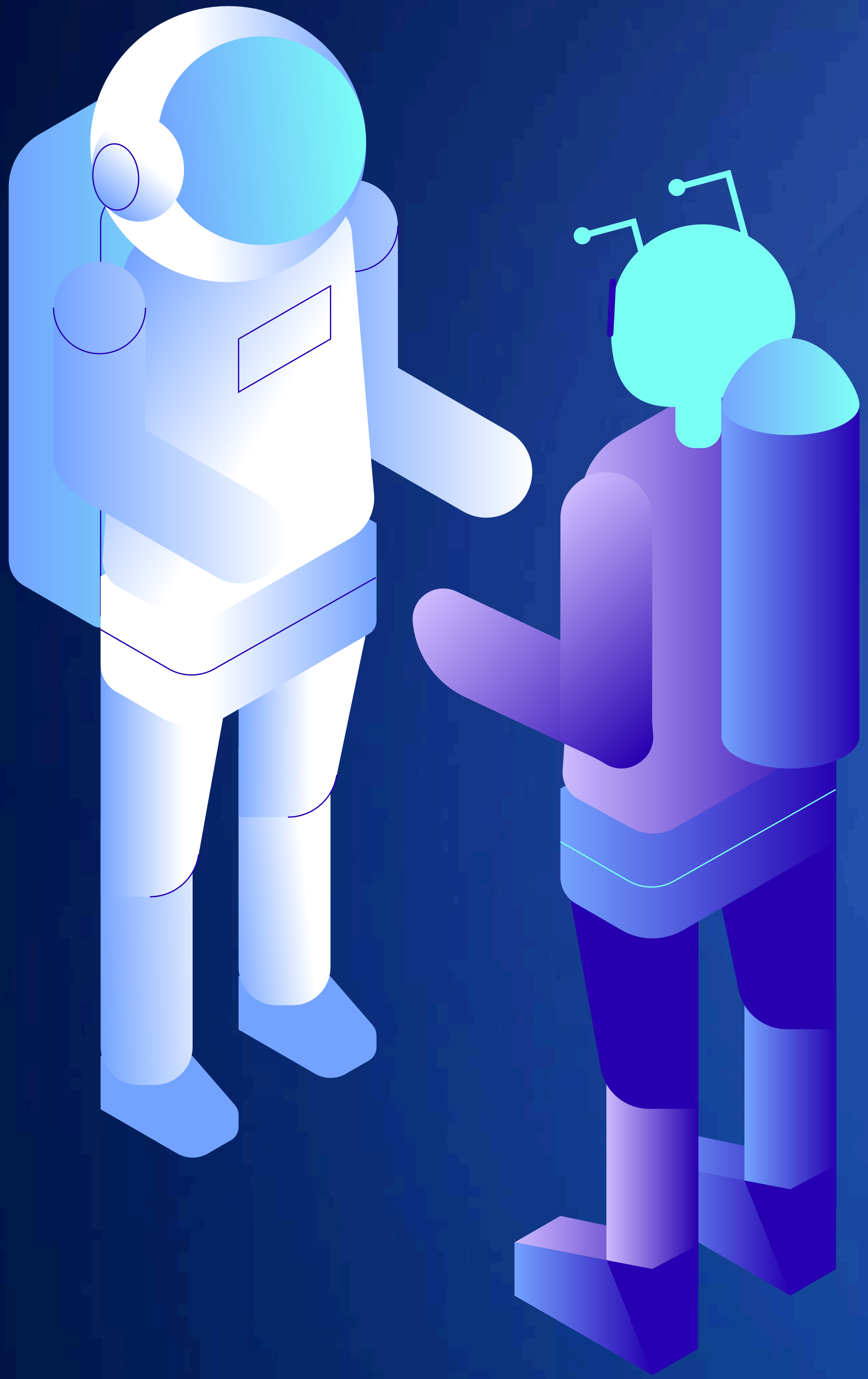
- **Uses:** Binary is the foundational number system in digital computing and electronic systems. All computer operations are ultimately reduced to binary instructions (0s and 1s), which represent off and on electrical states.

- **Significance:** Binary's simplicity makes it ideal for representing data in computers. It underlies the architecture of computer processors, memory, and storage devices.

OCTAL NUMBER SYSTEM

- **Uses:** Historically used in early computer systems, particularly those with word sizes that are multiples of 3 (e.g., 6-bit, 9-bit systems). Today, it is used in certain applications like Unix file permissions.

- **Significance:** The octal system provided a compact way to represent binary data before the widespread adoption of hexadecimal.



HEXADECIMAL NUMBER SYSTEM

- **Uses:** Hexadecimal is commonly used in computing to represent memory addresses, color codes in web design, and machine-level instructions in assembly language.

- **Significance:** It provides a more human-readable representation of binary data, as it is easier to convert large binary numbers to hexadecimal. Each hexadecimal digit represents 4 binary digits (bits), which makes it a concise and efficient way to express binary numbers.

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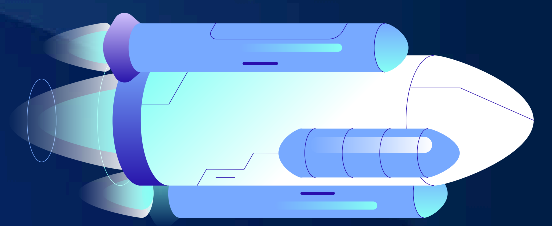

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