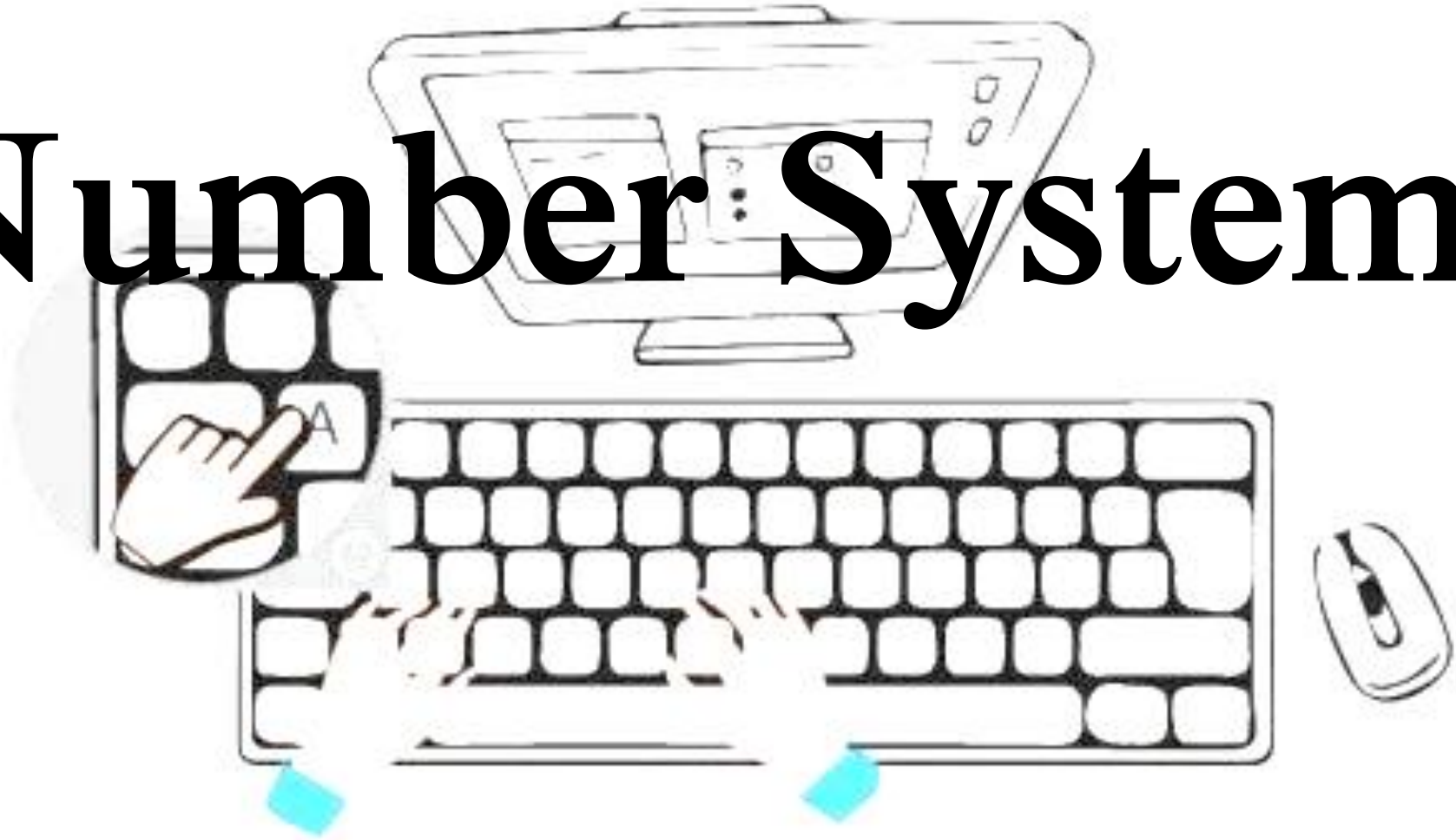
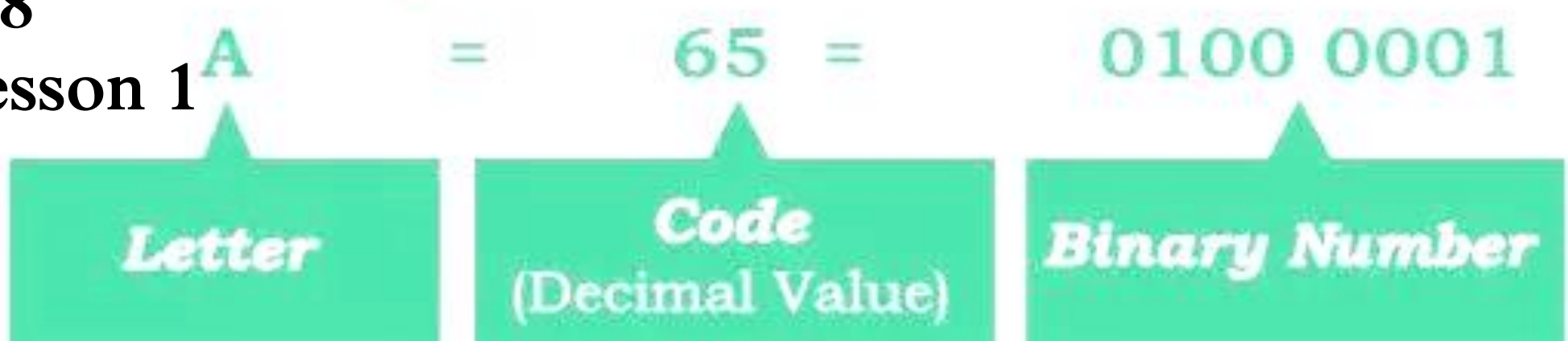
Number Systems



Grade 8
ICT Lesson 1



What is a Number System?

- A number system is a way of representing numbers using specific symbols and rules.
- Humans use numbers for counting, calculating, and measuring.
- Computers, however, use a unique numbering system called the **binary number system** to process information.

Symbols and Base of a Number System

Every number system is defined by:

1.Symbols: The digits used to represent numbers.

2.Base (or Radix): The total number of unique symbols in the system.

Common Number Systems

Number System	Symbols	Base
Decimal	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	10
Binary	0, 1	2
Octal	0, 1, 2, 3, 4, 5, 6, 7	8
Hexadecimal	0-9, A, B, C, D, E, F	16

The Binary Number System

- The binary system is a base-2 number system that uses only two symbols: **0** and **1**.
- Computers use binary because electronic circuits have two states: ON (1) and OFF (0).
- Every piece of data a computer processes, from text to images, is represented in binary.

The Decimal Number System

- The decimal system is a base-10 number system that uses ten symbols (0 through 9).
- This is the number system humans use daily for calculations, money, and measurements.

Converting Between Decimal and Binary

1. Converting Decimal to Binary

To convert a decimal number into binary, follow these steps:

- Divide the decimal number by 2.
- Record the remainder (0 or 1).
- Divide the quotient by 2 and repeat until the quotient becomes 0.
- Write the remainders in reverse order to get the binary equivalent.

Example: Convert 13 to Binary

13 ÷ 2 = 6 remainder **1**

6 ÷ 2 = 3 remainder **0**

3 ÷ 2 = 1 remainder **1**

1 ÷ 2 = 0 remainder **1**

Binary equivalent: **1101**

2. Converting Binary to Decimal

To convert a binary number into decimal:

- Write down the binary number.
- Multiply each binary digit by 2 raised to the power of its position (starting from 0 on the right).
- Add the results.

Example: Convert 1101 to Decimal

1 1 0 1

2^3 2^2 2^1 2^0

8 4 2 1

8+4+1

Decimal equivalent: **13**

Practice Questions

1. Convert the decimal number **25** to binary.
2. Convert the binary number **10101** to decimal.
3. What is the base of the hexadecimal number system?
4. Why do computers use the binary number system?
5. How is text data represented in binary?