ALL ABOUT NUMBER SYSTEMS

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TODAY'S AGENDA

What are Number Systems?

Types of Number Systems

What are the uses/significance of each number system?

WHAT ARE NUMBER SYSTEMS

A number system is a mathematical method for representing numbers, allowing arithmetic operations like addition, subtraction, multiplication, and division. It includes binary, octal, decimal, and hexadecimal number systems with distinct attributes.

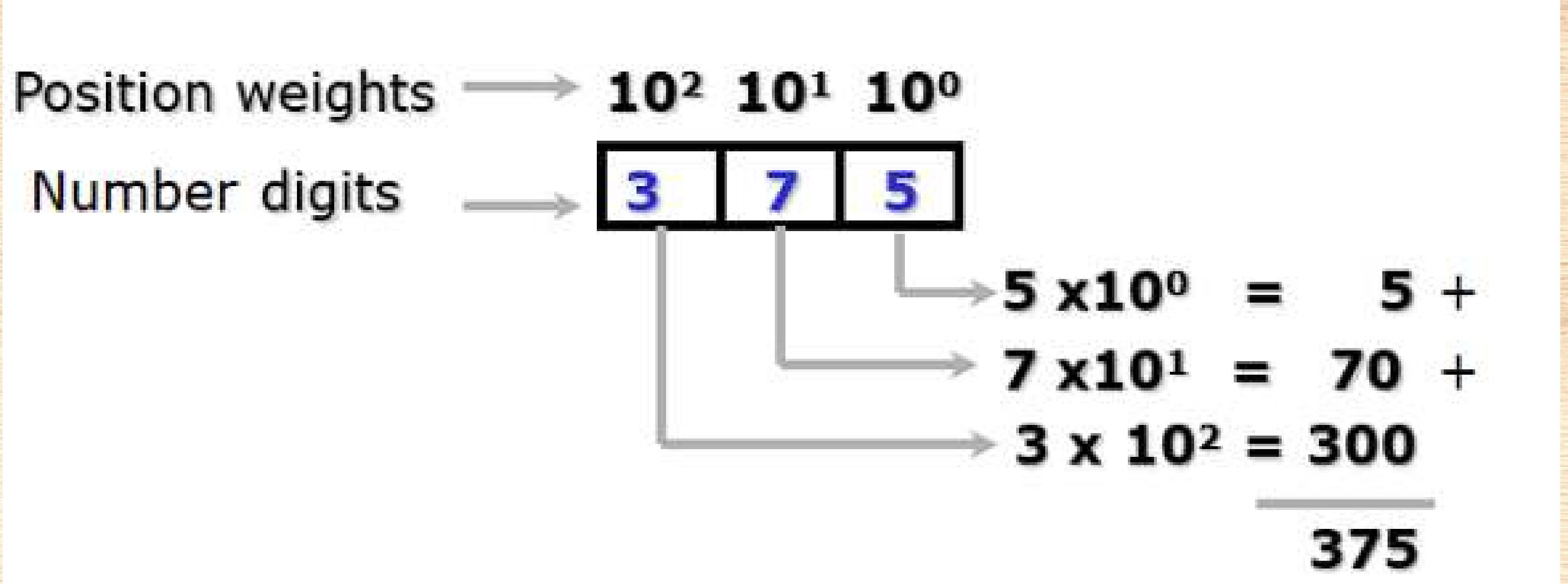
INTRODUCTION TO COMPUTING

WHAT ARE NUMBER SYSTEMS

- The decimal number system
- The octal number system
- The binary number system
- The hexadecimal number system

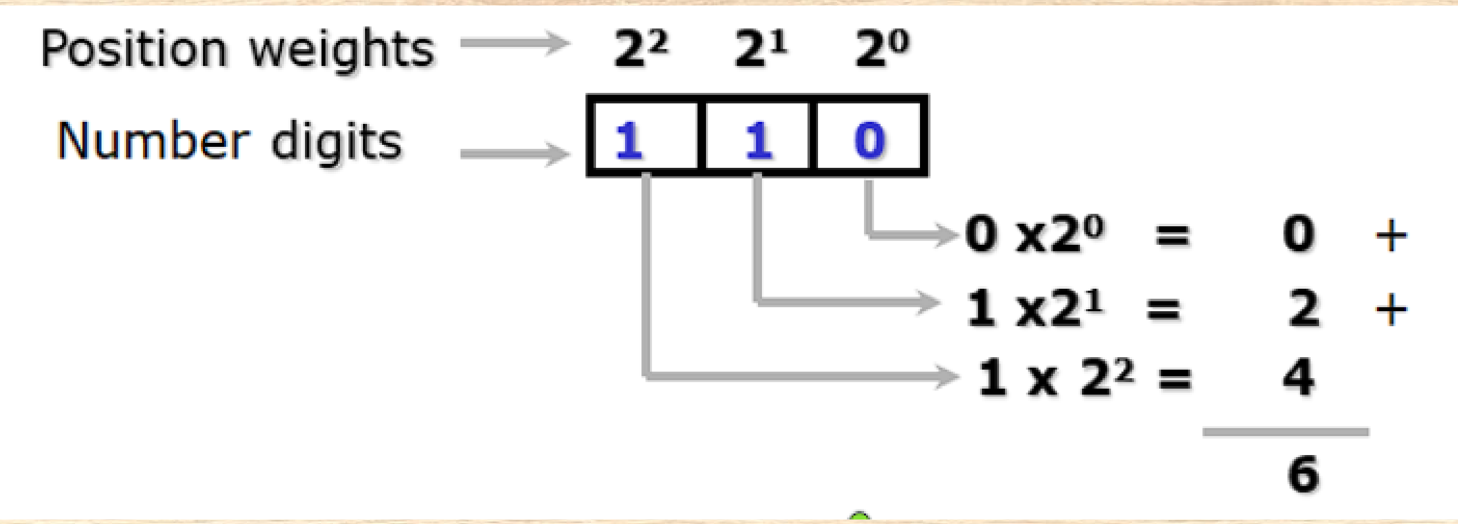
DECIMAL NUMBER SYSTEM

The base 10 number system, also known as the decimal number system, uses digits 0-9 to represent numbers. Each digit has a place value, which increases by 10 times as we move from right to left. The decimal number system uses ten digits (0,1,2,3,4,5,6,7,8,9) with a base of 10. Any number without a base is represented as 10.



BINARY NUMBER SYSTEM

A computer understands only the "on" and "off" states of a switch, represented by 1 and 0. The binary number system uses positional notation, with each digit multiplied by a power of two. A bit is the smallest unit of memory or instruction on a computer, either a 0 or 1. Combinations of bytes, known as kilobytes, form collections of 1000 bytes, with kilobytes containing approximately one thousand letters.



OCTAL NUMBER SYSTEM

The octal number system, used in minicomputers, uses eight digits (0 to 7), with a base of 8, and is similar to binary but excludes 8 and 9 digits. It represents numbers with a base of 8.

Positional powers of 8:	8^2	8^1	8^0
Decimal positional value:	64	8	1
Octal number:	3	5	7

$$(3 \times 64) + (5 \times 8) + (7 \times 1)$$
$$192 + 40 + 7$$
$$357_8 = \underline{239}_{10}$$

HEXADECIMAL NUMBER SYSTEM

The hexadecimal number system uses sixteen digits/alphabets, with the base number being 16. A-F represents numbers 10-15 in the decimal number system.

Hexadecimal	0	1	2	3	4	5	6	7	8
Decimal	0	1	2	3	4	5	6	7	8

Hexadecimal	9	A	B	C	D	E	F
Decimal	9	10	11	12	13	14	15

Positional powers of 16:	16^3	16^2	16^1	16^0
Decimal positional value:	4096	256	16	1
Hexadecimal number:		1	F	4

$$(1 \times 256) + (F \times 16) + (4 \times 1)$$
$$= (1 \times 256) + (15 \times 16) + (4 \times 1)$$
$$= 256 + 240 + 4 = 500_{10}$$

CONVERSION

BINARY TO DECIMAL

101101_2

$1 \times 2^0 = 1$

$0 \times 2^1 = 0$

$1 \times 2^2 = 4$

$1 \times 2^3 = 8$

$0 \times 2^4 = 0$

$1 \times 2^5 = 32$

$32 + 8 + 4 + 1 = 45_{10}$

OCTAL TO DECIMAL

140_8

$8^2 \quad 8^1 \quad 8^0$

$\downarrow \quad \downarrow \quad \downarrow$

$64 \quad 8 \quad 1$

$(1 \times 64) + (4 \times 8) + (0 \times 1)$

$64 + 32$

$= 96_{10}$

HEXADECIMAL TO DECIMAL

$23E_{16}$

$16^2 \quad 16^1 \quad 16^0$

$\downarrow \quad \downarrow \quad \downarrow$

$256 \quad 16 \quad 1$

$(2 \times 256) + (3 \times 16) + (14 \times 1)$

$512 + 48 + 14$

$= 574_{10}$

DECIMAL TO BINARY

45_{10}

2 | 45	
2 | 22	1
2 | 11	0
2 | 5	1
2 | 2	1
2 | 1	0
1	1

$= 101101_2$

DECIMAL TO OCTAL

96_{10}

8 | 96	
8 | 12	0
8 | 1	4
	1

$= 140_8$

DECIMAL TO HEXADECIMAL

574_{10}

16 | 574	
16 | 35	14 = E
16 | 2	3
	2

$= 23E_{16}$

CONVERSION

BINARY TO OCTAL

110101_2

101 = 5

110 = 6

$= 65_8$

BINARY TO HEXADECIMAL

10110111_2

0111 = 7

1011 = 11 or B

$= B7_{16}$

OCTAL TO HEXADECIMAL

213_8

3 = 011

1 = 001

2 = 010

0100 01011

8 B

$= 8B_{16}$

OCTAL TO DECIMAL

65_8

6 = 110

5 = 101

$= 110101_2$

HEXADECIMAL TO DECIMAL

B7

B = 1011

7 = 0111

$= 10110111_2$

HEXADECIMAL TO OCTAL

$8B_{16}$

8 = 1000

B = 1011

10001011

2 1 3

$= 213_8$

THANK YOU

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