

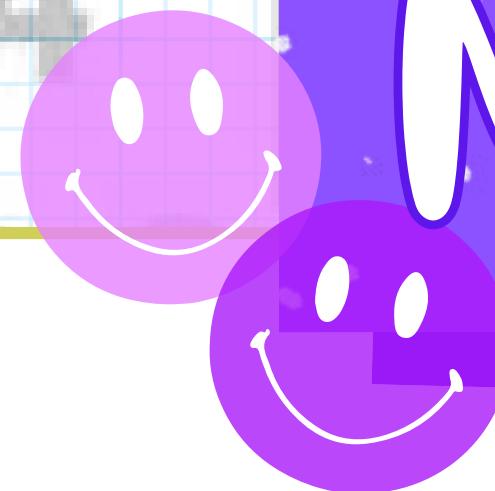
Number

Systems

Portfolio #3



Number System



The language of numbers, like any language, has its own alphabet"

Method of writing numerals to represent values

Different types of number systems; decimal, binary, octal and hexadecimal.
Each with its own base.



Decimal



Is a base 10 number system (0,1,2,3,4,5,6,7,8,9)

The maximum value of a single digit is 9

Each position of a digit represents a power of the base (10)



Decimal



Example:

Decimal digit 2586 = $(2*10^3)+(5*10^2)+(8*10^1)+(6*10^0)$
= 2000 + 500 + 80 + 6



Binary



A Base 2 number system (0,1)

The maximum value of a single digit is 1

Each position of a digit represents a specific power of the base(2)



Binary



Example:

$$\begin{aligned}\text{Binary digit } 10101 &= (1*2^4) + (0*2^3) + (1*2^2) + (0*2^1) + (1*2^0) \\&= 16 + 0 + 4 + 0 + 1 \\&= 21 \text{ base 10}\end{aligned}$$



Note!



In order to be specific about which number system we are referring to, it is a common practice to indicate the base as a subscript.

BIT - stands for binary digit

-A bit in computer terminology means either a 0 or a 1.

-A binary number consisting of n bits is called an n -bit number



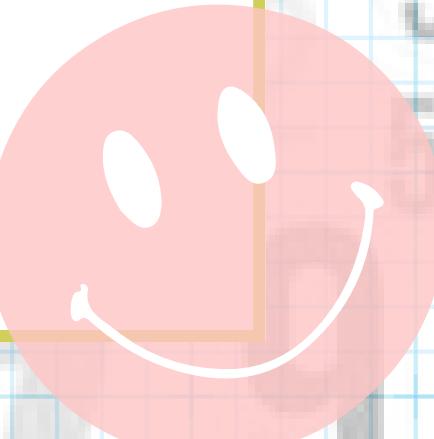
Octal



Is a base 8 number system (0,1,2,3,4,5,6,7)

The maximum value of a single digit is 7

Each position of a digit represents a power of the base (8)



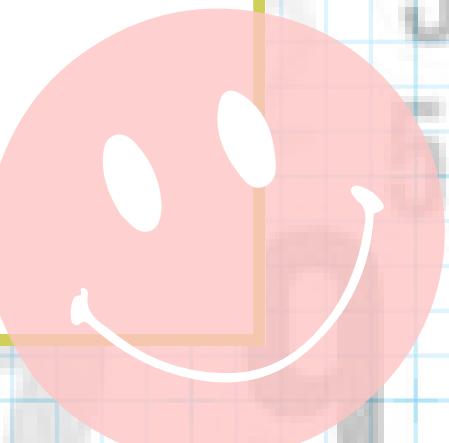
Octal



- Since there are only 8 digits, 3 bits ($2^3=8$) are sufficient to represent any octal number in binary

Example:

$$\begin{aligned}3075 \text{ base } 8 &= (3*8^3)+(0*8^2)+(7*8^1)+(5*8^0) \\&= 1536 + 0 + 56 + 5\end{aligned}$$



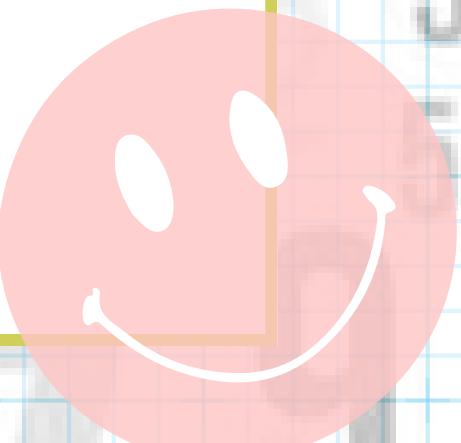
Hexadecimal



Is a base 16 number system (0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F)

A, B, C, D, E, and F represent the decimal values 10, 11, 12, 13, 14, and 15 respectively

The maximum value of a single digit is 15



Hexadecimal



- Since there are only 16 digits, 4 bits ($2^4=16$) are sufficient to represent any octal number in binary

Example:

$$\begin{aligned}8\text{EF base } 16 &= (8 * 16^2) + (E * 16^1) + (F * 16^0) \\&= 8 * 256 + 14 * 16 + 15 * 1 \\&= 2048 + 224 + 15 \\&= 431 \text{ base } 10\end{aligned}$$



Importance



- Used to represent data
- Helps us understand how computers and systems work
- Provide a framework for mathematical operations and calculations.
- Used in daily life from counting to measuring
- Understanding number systems helps people make informed decisions when solving a problem



Reaction/Analysis



Numbers are the building blocks of our Universe. Numbers are found anywhere. Numbers has always been a part of our life. Number system is the system used to represent and manipulate numbers and it is useful in understanding how computers and systems work in our modern world. The decimal system, the one we're most familiar with, is based on ten digits (0 to 9). It's a convenient system for everyday tasks like counting money or measuring distances. However, for computers, which operate on a fundamentally different principle, the binary system is more efficient. Using only two digits (0 and 1), binary code allows computers to process information at incredible speeds. Other number systems, like octal (base 8) and hexadecimal (base 16), have their own unique applications. Octal is sometimes used in computer programming due to its easier conversion to and from binary. Hexadecimal, with its sixteen digits (0-9 and A-F), is often used in computer graphics and addressing memory locations. The importance of number system goes beyond mathematical implications. the reason for such is it is the foundation of modern technology, such as computers, smartphones and many other device. Understanding this system helps every field understand how every device works especially in field such us computer science, engineering, information technology and mathematics. Numbers system is also the language in which we can communicate with computers or the language used to help computers understand our commands as users. This system will undoubtedly remain a very important too in understanding technology forever.



Resources



WHAT IS NUMBER SYSTEM?

Number System S.V. Fomin second edition by Joan W. Teller and Thomas P Branson

<https://archive.org/details/fomin-number-systems>

ERIC WEISSTEIN

<https://mathworld.wolfram.com/>

<https://byjus.com/math/number-system/>

TESTBOOK EDU SOLUTIONS

<https://www.toppr.com/guides/computer-aptitude-and-knowledge/basics-of-computers/number-systems/>

SO Duke & NJ Obidunnu

<https://testbook.com/math/number-system> <https://www.ajol.info/index.php/gjpas/article/view/45392>

WHAT ARE THE TYPE OF NUMBER SYSTEM?

ANIL CHANDRA JHA, NUTA JOURNAL 7 2020

<https://nepjol.info/index.php/nutaj/article/view/39924/30409>

Shuhua An, et, al.

https://www.educationforatoz.com/images/2017_1-2_Jeanne_Koudogbo_.pdf



Resources



ARON STEELE, et, al.

https://www.researchgate.net/profile/Aaron-Steele-2/publication/292983477_An_evaluation_of_different_delivery_methods_for_teaching_binary_hex_and_decimal_conversion/links/56b3b4b508ae61c480580f39/An-evaluation-of-different-delivery-methods-for-teaching-binary-hex-and-decimal-conversion.pdf

Binary Numbers, Hexadecimal Numbers, and Registers. by Jo Van Hoey

https://link.springer.com/chapter/10.1007/978-1-4842-5076-1_2

Darko Odic, University of British Columbia; Ariel Starr, University of California, Berkeley.

<https://srcd.onlinelibrary.wiley.com/doi/abs/10.1111/cdep.12288>

WHAT IS THE SIGNIFICANCE OF NUMBER SYSTEM?

<https://www.geeksforgeeks.org/what-is-the-importance-of-the-number-system/>

<https://byjus.com/math/number-system/>

<https://www.chtips.com/computer-fundamentals/importance-of-number-system-in-computer/>

<https://unacademy.com/content/cat/study-material/mathematics/number-systems-in-real-life-situations/>

<https://www.cuemath.com/numbers/number-systems/>





THANK YOU

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