# Portfolio #3

# Analysis

What are the number systems? What are the different types of number systems? Number systems are commonly taught to students who learn about computing, and they commonly ask, What is there to learn about number systems? For any programs directly related to computing, learning the number systems is a foundational concept (Educative, n.d.; Jaro Education, n.d.). A formal definition of a number system is a system or a method to represent the digits of numbers; the total number of digits used in a number system is also called its base or radix (Mahat, 2021).

# Analysis

There are multiple types of number systems, namely, binary (base-2), ternary (base-3), quaternary (base-4), quinary (base-5), senary (base-6), octal(base-8), decimal (base-10), duodecimal (base-12), hexadecimal (base-16), etc (Dvorsky, 2013; Jha & Balmiki Campus, Nepal Sanskrit University Nepal, 2020). Out of the several number systems, the four most common of them all are the decimal, binary, octal, and hexadecimal systems. The word binary comes from the Latin root word bini, which means two each, showing that the system only has two digits, 0 and 1. The decimal system derived from the Latin root word decen, which means ten, and so the decimal number system only has 10 digits, from 0 to 9. The octal number system comes from the root Latin word octo, which means 8, and so the digits of the octal number system is also 8 from 0 to 7, same applies to the hexadecimal number system whose term is derived from the Latin root word hex (six), and decen (ten) and has 16 alphanumeric values from 0 to 9, and A to F.

# Analysis

Having understood the common types of number systems, let’s understand why these are fundamental when learning about computing. The decimal number system is the most common of all, since this is the very basis of how humans count; the number of digits is due to the number of fingers humans have, which is 10 (Educative, n.d.). This doesn’t mean that computers also use the decimal number system; this is where binary numbers are used, and a computer uses bits or a single digit of a binary sequence, wherein a bit can either have one of two states, a 1 or a 0. Now, there should be a way to translate decimal numbers to binary numbers so that the computer can understand what numbers to use, this is where the hexadecimal, and octal number systems come in play, in a computer the hexadecimal number system makes it easier to store numbers because it only requires 4 bits to represent a digit’s value, and three for octal (Educative, n.d.). Octal has practical applications in computer programming and digital circuit design. When dealing with large binary values, octal simplifies the readability of numerical representations. The hexadecimal number system is very important when programming, as memory addresses and machine code instructions are commonly represented in hexadecimal, and it simplifies bitwise operations and binary arithmetic (Jaro Education, n.d.).

# What are Number Systems?

A system or a method to represent the **digits** of numbers; the total number of digits used in a number system is also called its **base** or radix (Mahat, 2021).

$$6_{10}$$

base

# Types of Number Systems

There are multiple types of number systems, namely, binary (base-2), ternary (base-3), quaternary (base-4), quinary (base-5), senary (base-6), octal(base-8), decimal (base-10), duodecimal (base-12), hexadecimal (base-16), etc (Dvorsky, 2013; Jha & Balmiki Campus, Nepal Sanskrit University Nepal, 2020). Out of the several number systems, the four most common of them all are the **decimal**, **binary**, **octal**, and **hexadecimal** systems.

# Types of Number Systems

| Binary | Decimal | Octal | Hexadecimal |
| --- | --- | --- | --- |
| **Computers** utilize transistors that have **two distinct states,** which can be applied to the **two digits** used. | The decimal number system is the most common of all, since this is the very **basis** of how **humans** count | When dealing with **large binary** values, octal **simplifies** the readability of numerical representations | The hexadecimal number system makes it **easier** to store numbers because it only requires **4 bits** to represent a digit’s value |

# References


Dvorsky, G. (2013, January 18). Why We Should Switch To A Base-12 Counting System. Retrieved October 14, 2025, from http://io9.com/5977095/why-we-should-switch-to-a-base12-counting-system/all

Educative. (n.d.). Computer number systems: Binary, octal, hexadecimal, and conversions. Educative. Retrieved from https://www.educative.io/blog/computer-number-systems-binary-hexadecimal-conversions

Jha, A. C. & Balmiki Campus, Nepal Sanskrit University Nepal. (2020). Positional Number system. In NUTA JOURNAL (Vol. 7, Issues 1 & 2).

Lande, D. R. (2014). Development of the binary number system and the foundations of computer science. The Mathematics Enthusiast, 11(3), 513–540. https://doi.org/10.54870/1551-3440.1315

Latif, S., Qayyum, J., Lal, M., & Khan, F. (2011). Novel approach to the learning of various number systems. International Journal of Computer Applications, 26(7), 18–28. https://doi.org/10.5120/3116-4283

Mahat, S. S. (2021). Number system conversion for beginners (Decimal to binary, octal and hexadecimal conversion). Turkish Journal of Computer and Mathematics Education (TURCOMAT), 12(14), 1445–1458. https://doi.org/10.17762/turcomat.v12i14.10470