Number Systems

**Number systems** are systems in mathematics that are used to express numbers in various forms and are understood by computers. A number is a mathematical value used for counting and measuring objects, and for performing arithmetic calculations. Numbers have various categories like natural numbers, whole numbers, rational and irrational numbers, and so on. Similarly, there are various types of number systems that have different properties, like the binary number system, the octal number system, the decimal number system, and the hexadecimal number system.

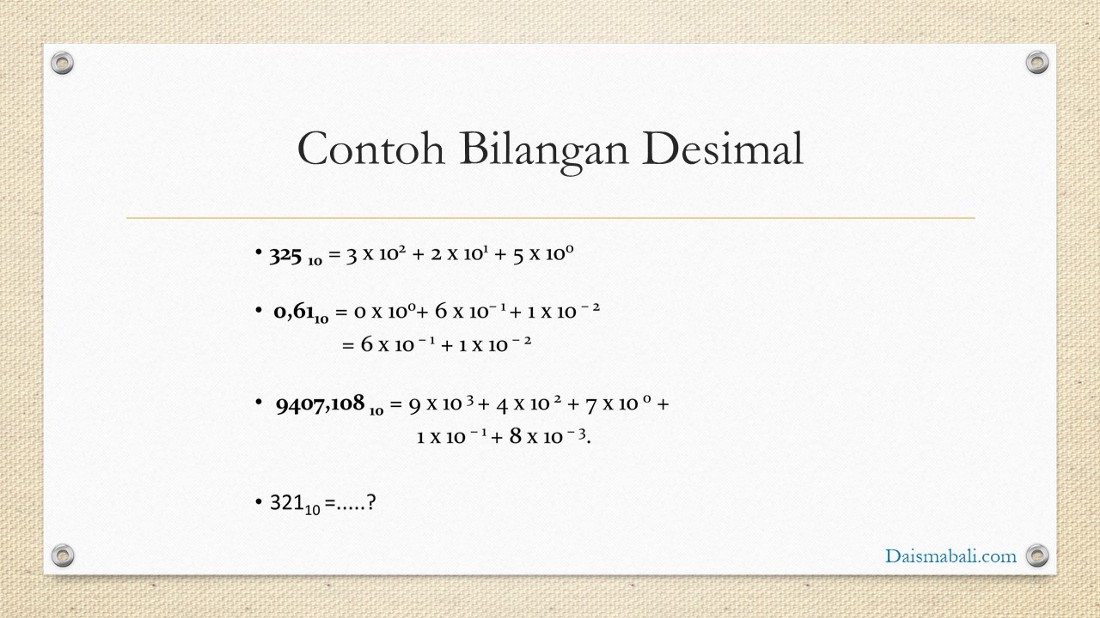
Kind of Number Systems

* Decimal Number System (Base 10)

Is a decimal number system using 10 kinds of symbols namely: 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9. The decimal number system can be a decimal integer and can also be a decimal fraction.

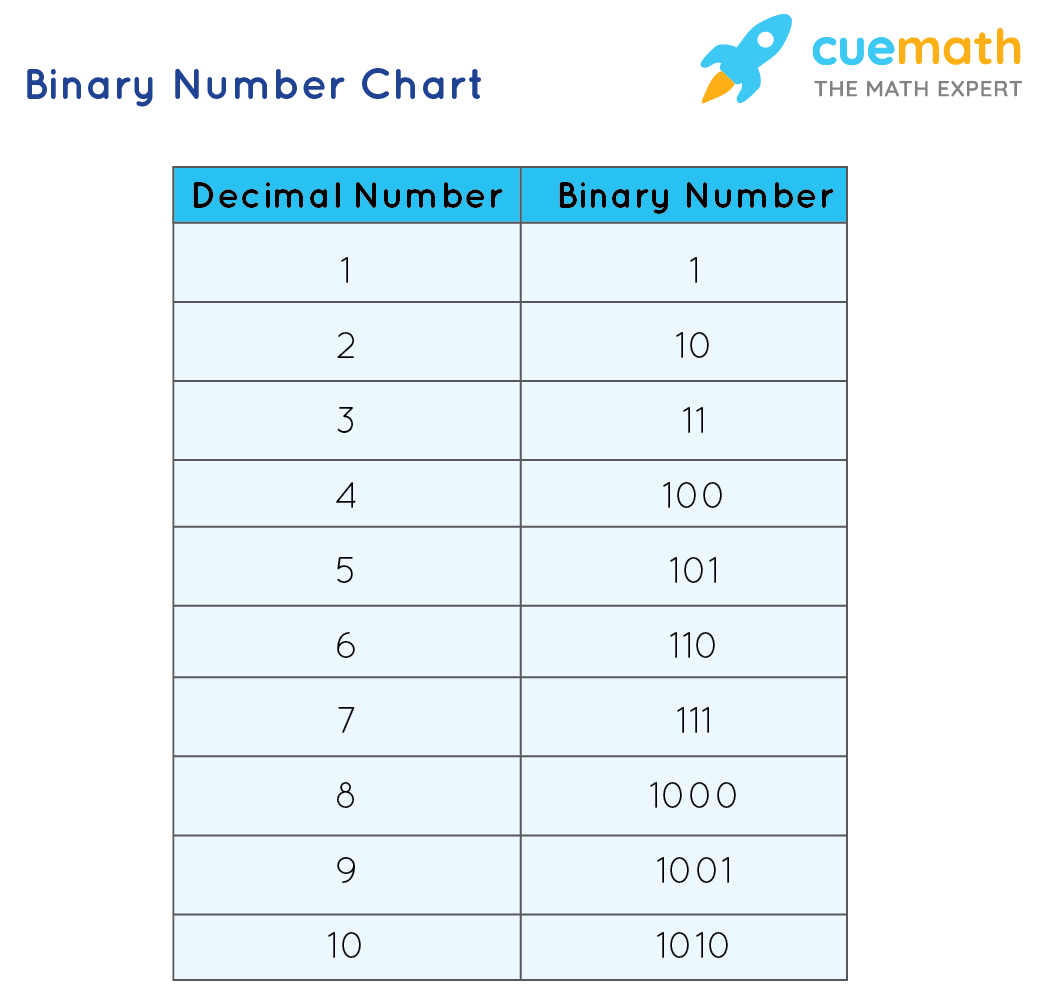
Here's the Notation : **∑(Nx10a)** with N = 0, 1, 2, 3, 4, 5, 6, 7, 8,9

a = ..., -3, -2, -1, 0, 1, 2, 3, ... ( an integer expressing the position relative of N to a comma or unit )



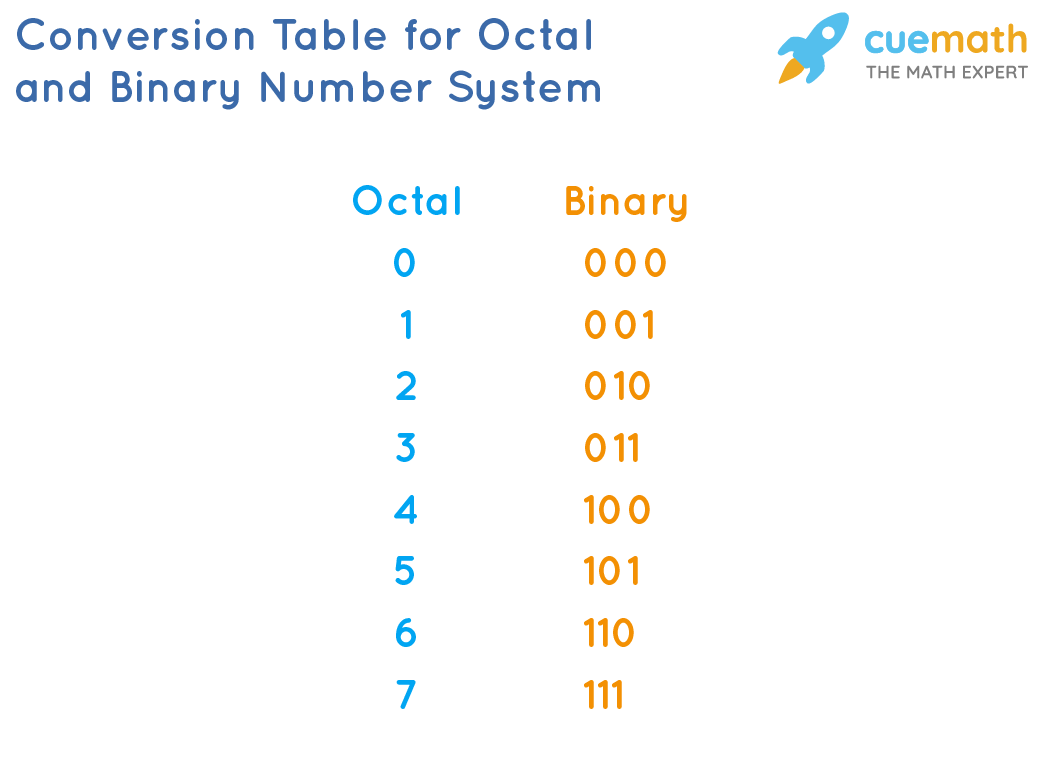
* Binary Number System (Base 2)

"Bi" in Binary means "two". Hence, this draws back the line to the representation of a number in terms of 0 and 1 only.



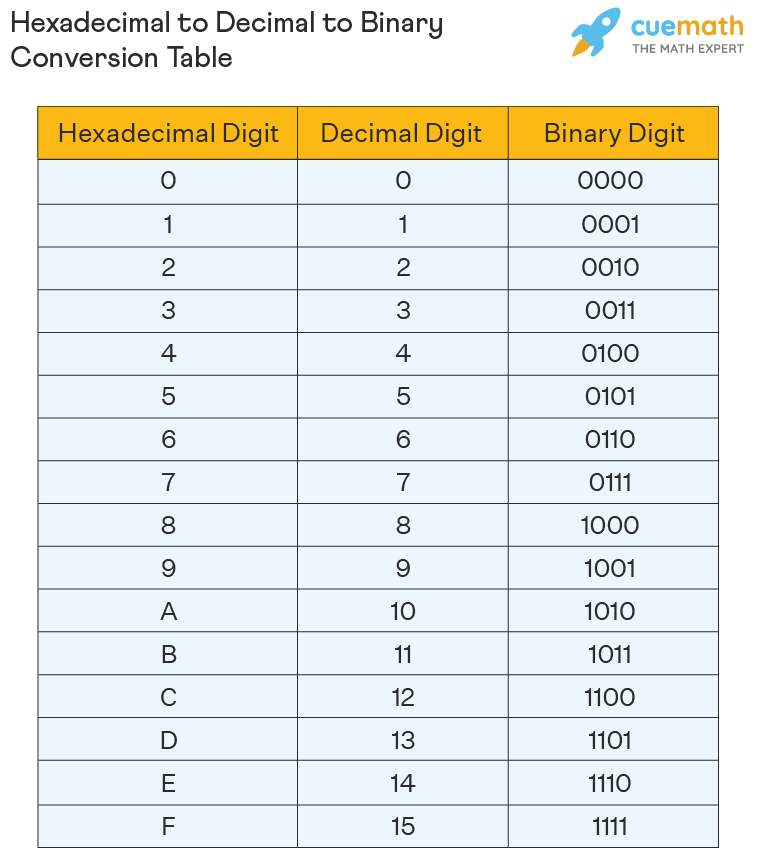
* Octal Number System (Base 8)

Octal Number System is a type of number system that has a base of eight and uses digits from 0 to 7.



* Hexadecimal Number System (base 16)

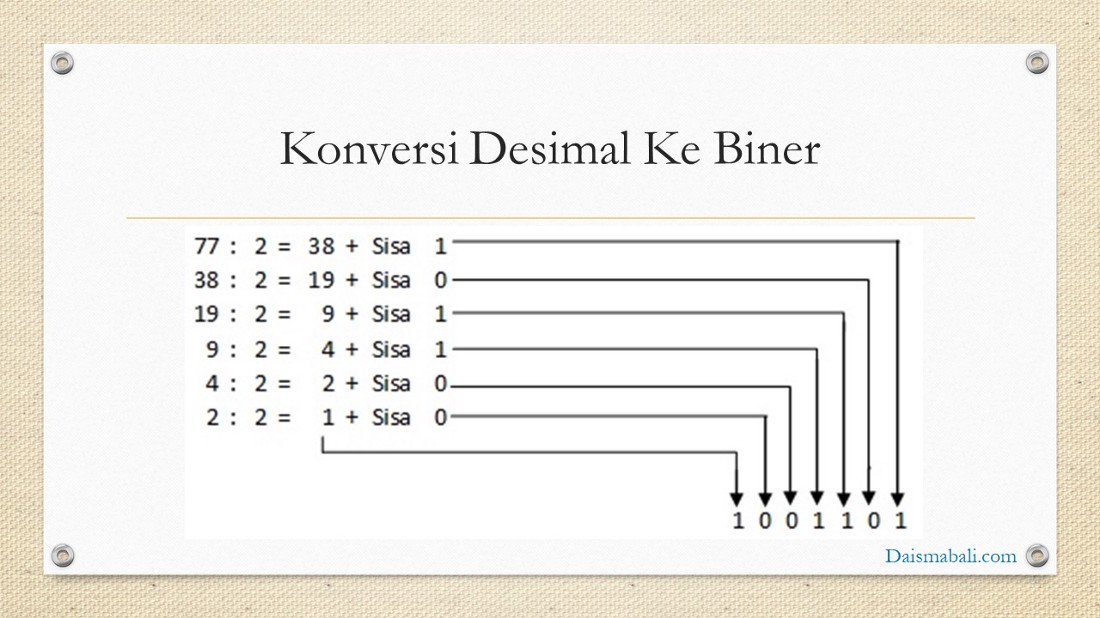
The base number of a hexadecimal number system is 16 which includes both numbers from 0 -9 and digits from A - F.

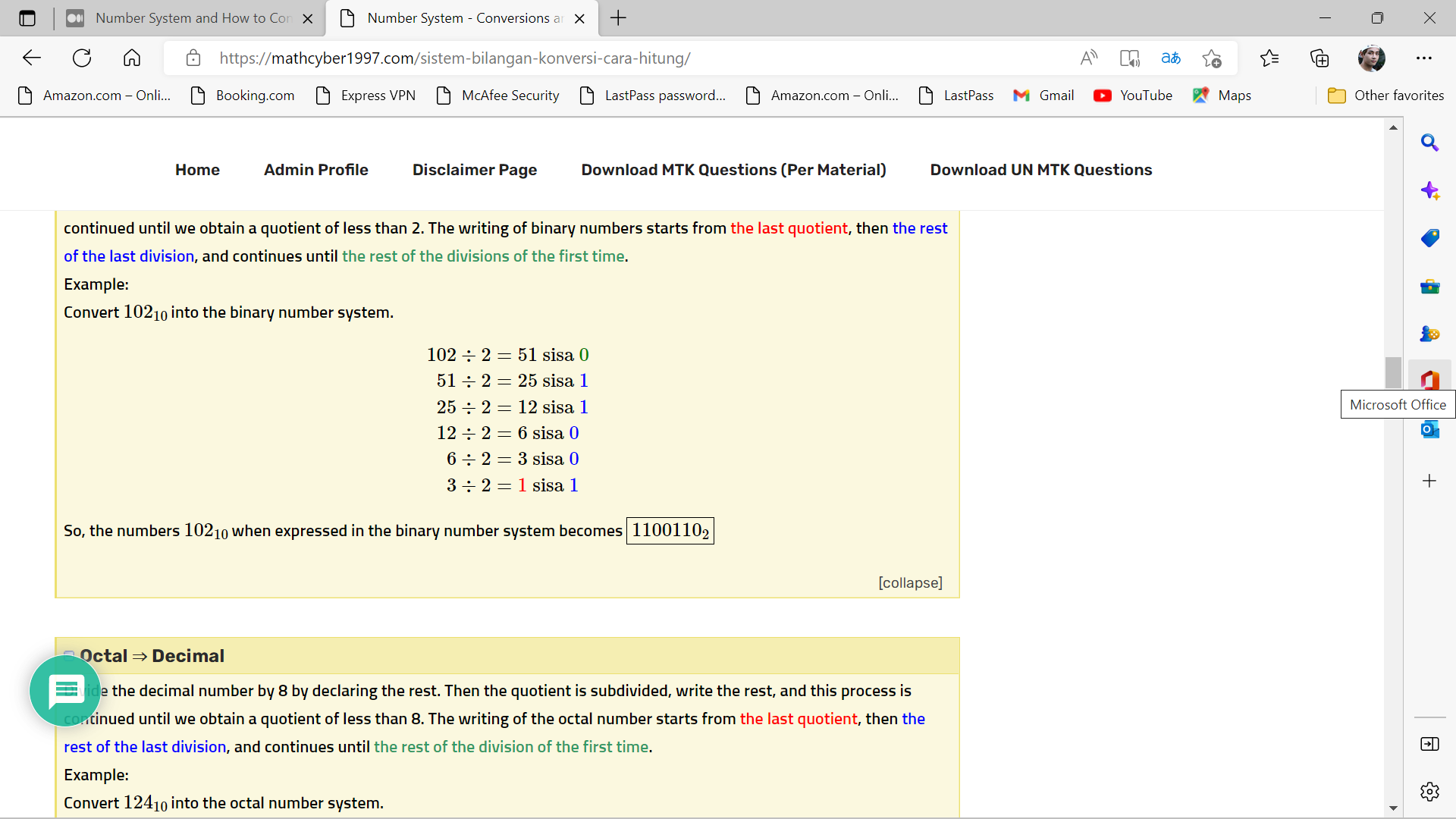


**Convert Decimal Number System to Other Number System**

* **Decimal to Binary**

The first way, divide the decimal number by 2 by declaring the rest. Then the quotient is subdivided, write the rest, and this process is continued until we obtain a quotient of less than 2. The writing of binary numbers starts from the last quotient, then the rest of the last division, and continues until the rest of the divisions of the first time. Here's an overview of the conversion of decimal number 77 to binary

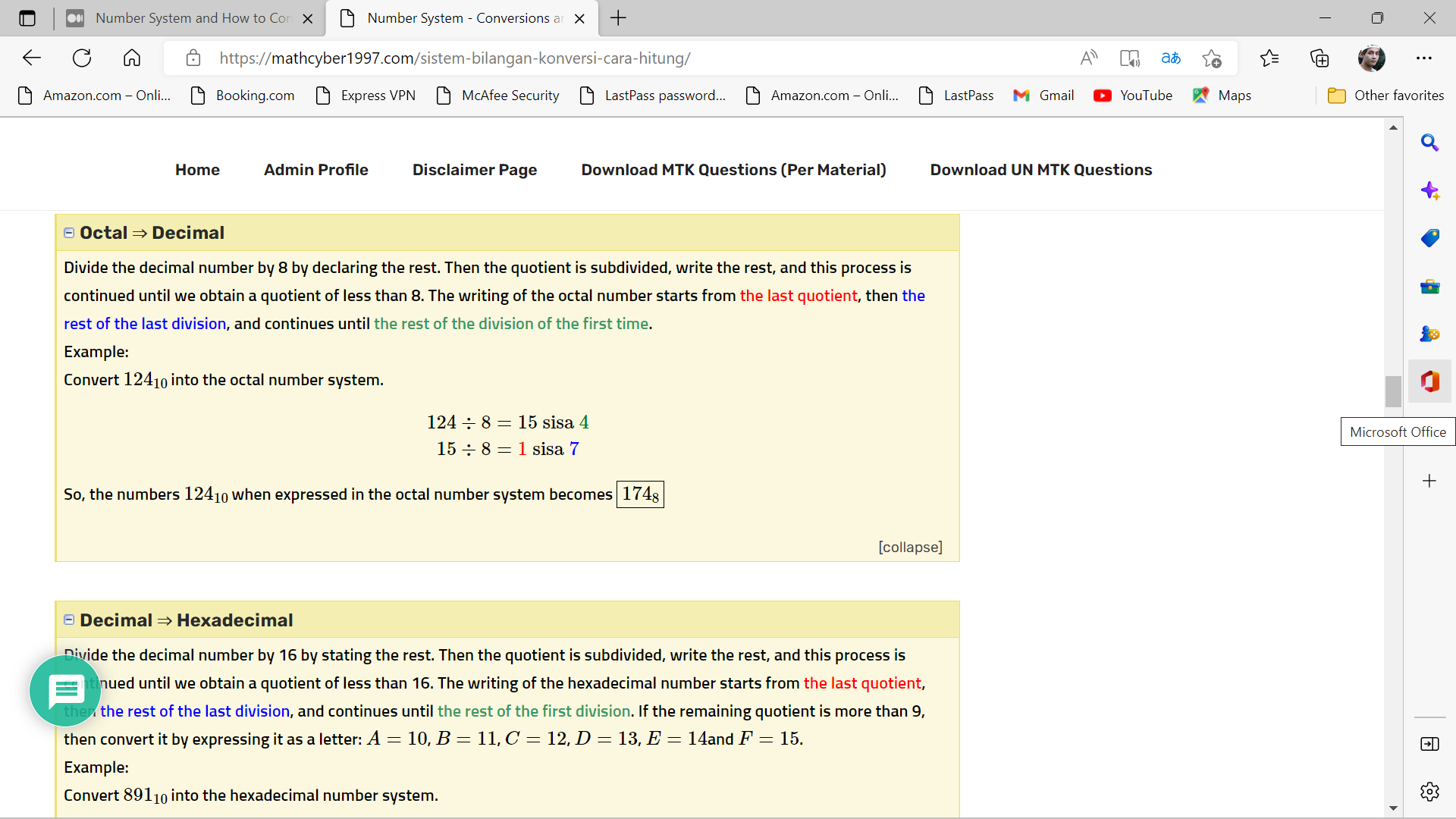




* **Decimal to Octal**

In this conversion, divide the decimal number by 8 by declaring the rest. Then the quotient is subdivided, write the rest, and this process is continued until we obtain a quotient of less than 8. The writing of the octal number starts from the last quotient, then the rest of the last division, and continues until the rest of the division of the first time. As shown below:



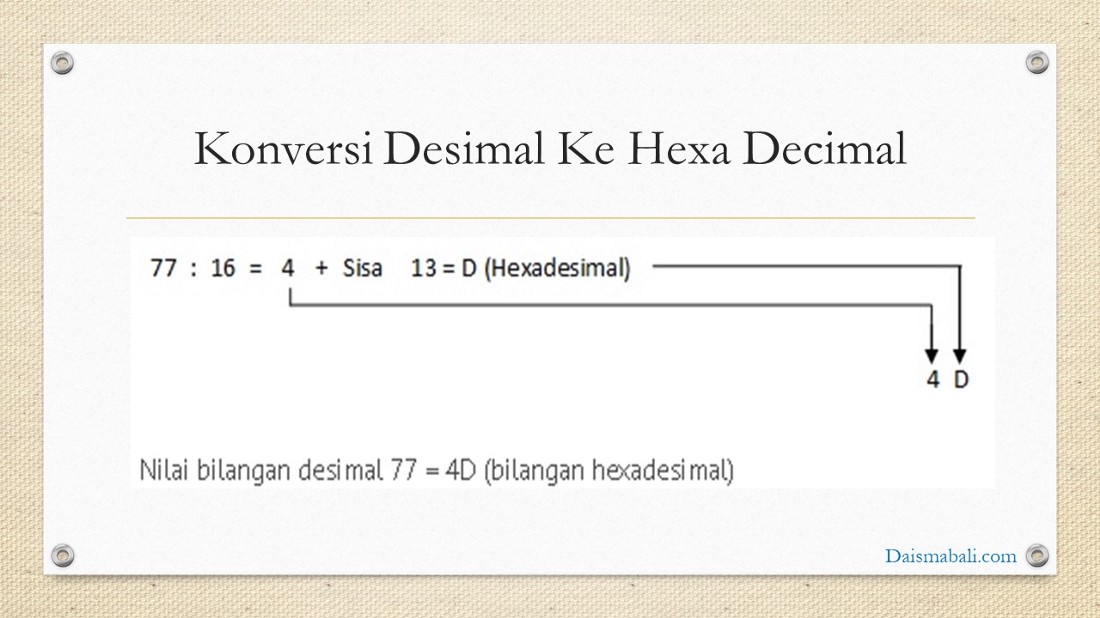


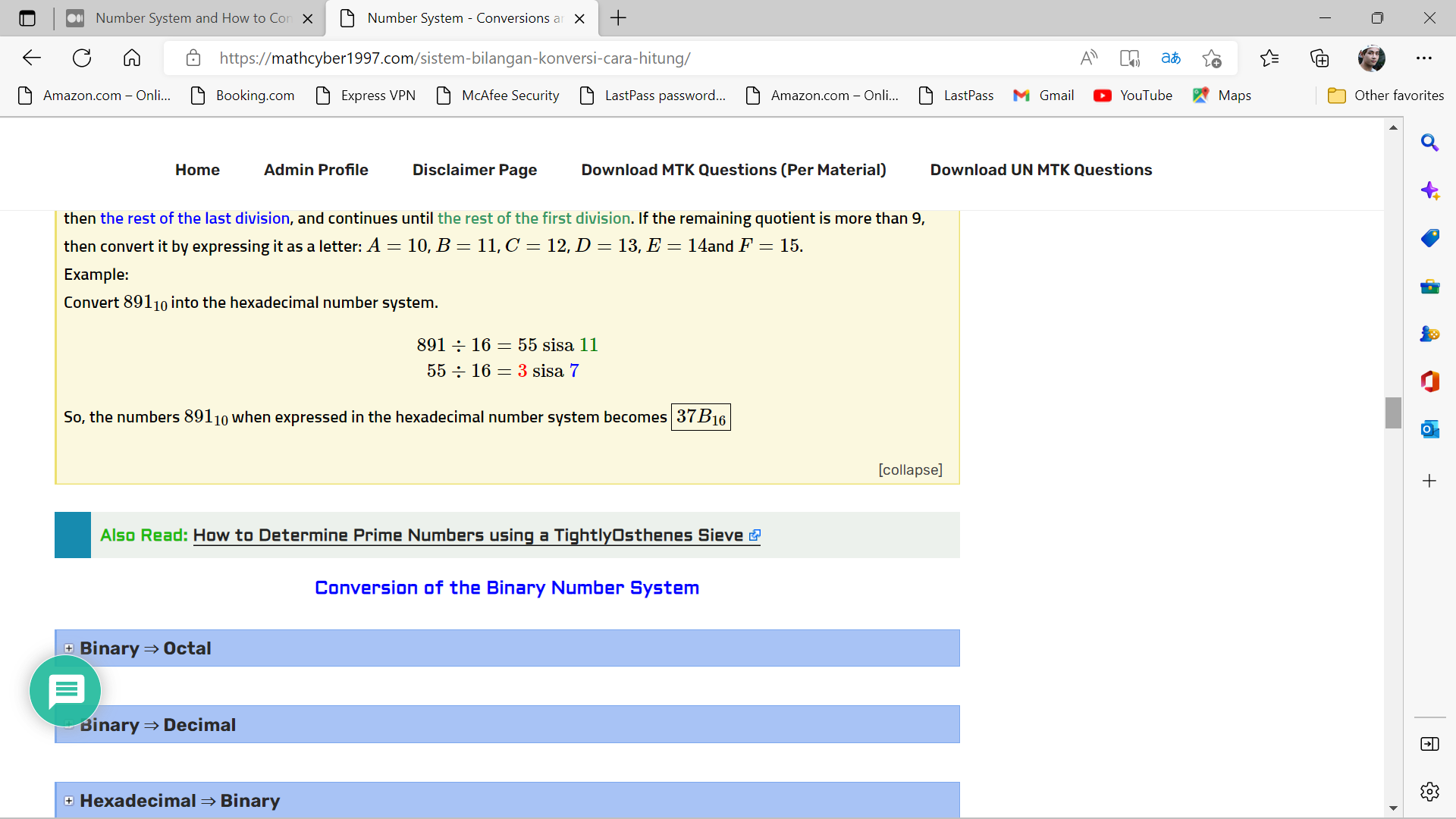
* **Decimal to Hexadecimal**

Number conversion by dividing a decimal number by 16 by stating the rest. Then the quotient is subdivided, write the rest, and this process is continued until we obtain a quotient of less than 16. The writing of the hexadecimal number starts from the last quotient, then the rest of the last division, and continues until the rest of the first division. If the remaining quotient is more than 9, then convert it by expressing it as a letter :

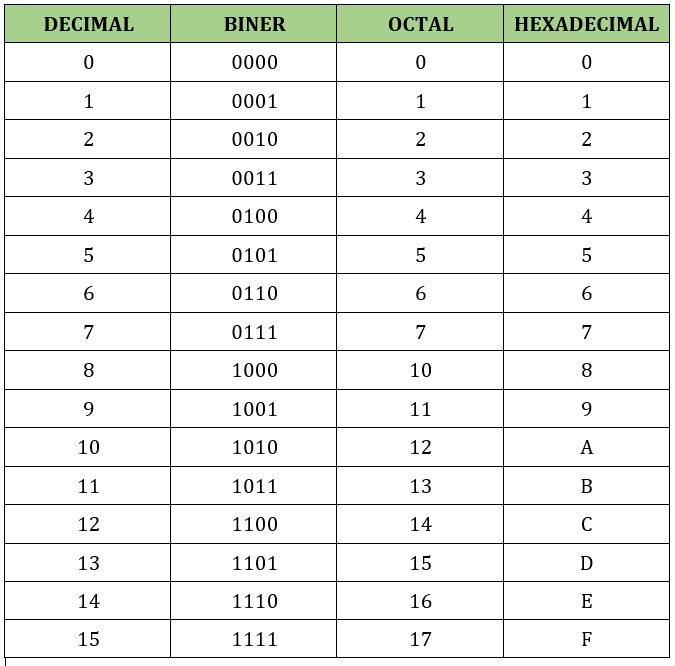
* 10 = A
* 11 = B
* 12 = C
* 13 = D
* 14 = E
* 15 = F

As shown below:





The table of a number system



Source :

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