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# Binary Number

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## I.INTRODUCTION

Binary numbers are a fundamental part of computer programming and digital electronics. They are a numbering system that uses only two digits, 0 and 1, instead of the ten digits used in the decimal system. Binary numbers represent data using only two states, such as on and off, high and low, or true and false. In this article, we will explore how binary numbers work, their significance in computing, and how to convert decimal numbers to binary and vice versa.

How binary numbers work:

Binary numbers use the base-2 numbering system. This means that every digit in a binary number can only have one of two possible values, either 0 or 1. In contrast, the decimal numbering system uses the base-10 system, which means that every digit can have one of ten possible values, from 0 to 9.

The place value of binary digits is determined by the power of 2. In other words, each digit in a binary number represents a power of 2. The rightmost digit, or the least significant bit (LSB), represents 2^0 (1). The digit to the left of the LSB represents 2^1 (2), the next digit to the left represents 2^2 (4), and so on. Each successive digit represents a power of 2 that is twice the value of the previous digit.

For example, the binary number 1011 represents:

1 x 2^3 + 0 x 2^2 + 1 x 2^1 + 1 x 2^0
= 8 + 0 + 2 + 1
= 11

The significance of binary numbers in computing

Binary numbers are used in computing because computers are electronic devices that operate using binary logic. In other words, they use on and off

signals to represent data. This is because electronic circuits can only distinguish between two states, on or off, which corresponds to the two digits used in binary numbers.

All digital devices, including computers, use binary numbers to store and process data. This means that every piece of data, such as text, images, and audio, is ultimately represented as a series of binary digits. By using binary numbers, computers can perform complex calculations and store vast amounts of data quickly and accurately.

Converting decimal numbers to binary:

To convert a decimal number to binary, we need to follow a few simple steps:

Divide the decimal number by 2 and write down the quotient and remainder.
Divide the quotient by 2 and write down the quotient and remainder.
Continue dividing the quotient by 2 until the quotient is 0.
Write down the remainders in reverse order. This gives the binary equivalent of the decimal number.
For example, to convert the decimal number 25 to binary:

25 / 2 = 12 remainder 1
12 / 2 = 6 remainder 0
6 / 2 = 3 remainder 0
3 / 2 = 1 remainder 1
1 / 2 = 0 remainder 1

The remainders in reverse order are 11001. Therefore, the binary equivalent of 25 is 11001.

Converting binary numbers to decimal

To convert a binary number to decimal, we need to multiply each digit by its corresponding power of 2 and add the results together.

For example, to convert the binary number 1011 to decimal:

1 x 2^3 + 0 x 2^2 + 1 x 2^1 + 1 x 2^0
= 8 + 0 + 2 + 1
= 11

Therefore, the decimal equivalent of the binary number 1011 is 11.

Conclusion: Thus we've learned what binary numbers are ,how do binary numbers work , significance of binary numbers in computing and conversion of binary to decimal