Binary is the essential groundwork for modern computing. It is a numbering system consisting of 2 digits, 1 and 0, hence the prefix “Bi-”. The binary numbering scheme is useful for computers, devices, and other digital machines because in essence, we can say it represents “On” and “Off” or “Yes” and “No”; this is critical as computers as devices that can execute millions of computations a second, and keeping decision making to a simple one-or-the-other statement allows them to solve a multitude of problems and perform various operations.

As stated, binary is read as a string of “1’s” and “0’s”. Each individual digit is called a “bit” or “binary digit”. Individual bits can only track 1 small value at a time, but by grouping bits together, such as 4 for a nibble or 8 for a byte, larger numbers and values can be represented. For example, the number 1 in base 10 – the common numbering system in western cultures – is just “1”, this is the same in binary; however, to create larger numbers, like the number 5, in base 10 one can simply write “5”, but a binary system would need to write “101”. Numbers in binary can be computed in a similar manner to numbers in base 10, where one would multiply the base (in this case 2) to the power of the nth index of the digit - starting at 0 – times the digit, then add for each digit. In the case for 5 it would be 1\*20 + 0 \* 21 + 1\*22 = 5. To convert back to base 10, you can do the reverse by continuously dividing by the same and tracking the remainders using modulo division.

While binary is useful for computers to store numbers, these numbers are far more useful then a way to track arbitrary digits. A byte’s value can be used in conjunction with an ASCII table to represent common letters and symbols of the English alphabet. A byte can also be a set of numbers that reference an RGB value for a pixel; here 3 bytes are stored with each being a number for Red, Green, and Blue individually, and when put with the other millions of pixels, can create an image.

In conclusion, binary/base-2 is a numbering system widely used by computers for the simplicity of only have an “On” or “Off” state with no ambiguity in between. This allows for an easy-to-read way for computers to follow tasks. Modern programming languages such as C abstract away binary into English words that convert into binary machine code which is the basis of all applications, photos, text, and everything else a person can interact with on a computer.