ASCII stands for American Standard Code for Information Interchange. It's a character encoding standard originally developed in the early 1960s for electronic communication. ASCII uses a 7-bit binary code to represent text characters, with each character being assigned a unique numerical value.

Here's a detailed breakdown of how ASCII works:

1. **Character Set**: ASCII includes 128 characters, which cover basic Latin letters, digits (0-9), punctuation marks, control characters (such as carriage return and line feed), and some special symbols.
2. **Binary Representation**: Each character in ASCII is represented by a 7-bit binary number, which means there are 2^7 (128) possible combinations. This allows for a total of 128 different characters to be encoded.
3. **Decimal Values**: The characters in ASCII are assigned decimal values ranging from 0 to 127. For example, the decimal value for the uppercase letter 'A' is 65, while the decimal value for the digit '0' is 48.
4. **Hexadecimal Representation**: Since 7 bits can represent values from 0 to 127, each ASCII character can be represented by two hexadecimal digits (0-9 and A-F). This is commonly used in programming and digital communication.
5. **Control Characters**: ASCII includes a range of control characters (such as carriage return, line feed, and backspace) that are used for formatting and controlling devices like printers and terminals.
6. **Extended ASCII**: While the original ASCII standard only used 7 bits, several extended versions were developed to accommodate additional characters. One of the most common is the 8-bit Extended ASCII, which adds an additional 128 characters, allowing for a total of 256 characters.
7. **Unicode**: While ASCII served its purpose well for many years, it has limitations, particularly in representing characters from languages other than English. Unicode was developed to address these limitations by providing a universal character encoding standard capable of representing characters from all languages and scripts around the world.

Despite the advent of Unicode, ASCII remains relevant in many contexts, particularly in legacy systems and for representing basic English text in computer systems and communication protocols.

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