Data is can be anything which represents the specific result or any number, text, image, audio, video etc. For example, If you will take an example of human being then data for a human being such that name, personal id, country, profession, bank account details etc. are the important data. Data can be divide into three categories such that data can be personal, public and private.

Forms of data representation :

At present Information comes in different forms such as follows.

1. Numbers
2. Text
3. Images
4. Audio
5. Video

Let's discuss it one by one.

1. **Numbers –**
   Numbers are not represented as ASCII but by bit patterns. Numbers are directly converted into binary representation to specify mathematical operations. The 0s and 1s used to represent digital data. The number system that humans normally use is in base 10.
   Number File Formats –
   Integer, Fixed point, Date, Boolean, Decimal, etc.
   Example :
   You may have encountered different ways of expressing numbers using "expanded form". For example, if you want to write the number 60338 in expanded form you might have written it as 60338=60000+300+30+8.

2. **Text –**
   Text is also represented as bit pattern or sequence of bits(such as 0001111). Various types of bits are assigned to represent text symbols. A code where each number represents a character can be used to convert text into binary.
   Text File Formats –
   .doc,.docx, .pdf, .rtf, .txt, etc.
   Example :
   The letter 'a' has the binary number 0110 0001.

3. **Audio –**
   Audio signal is a representation of sound or music. Audio differs from all i.e. from text, number and images. Audio is a series of binary numbers for digital signals. It is continuous but not discrete.
   Audio File Formats –

MP3, M4A audio file type, FLAC, WAV, WMA, AAC, etc.

4. **Video –**
   Video refers to the recording, broadcasting, copying or playback. Video can either be produced or it is continuous and sometimes it is a combination of multiple images produced in motion.
   Video File Formats –
   MP4, MOV, AVI, FLV, etc.

5. **Images –**
   Images are also represented as bit patterns. An image is composed of matrix of pixels with different values of pixels each where each pixel is represented as dots. Size of the picture is dependent on its resolution. Consider a simple black and white image. If 1 is black (or on) and 0 is white (or off), then a simple black and white picture can be created using binary.
   Image File Formats –
   Image can be in the format of jpeg, PNG, TIFF, GIF, etc.

Image Data Representation -
one bit per pixel (0 or 1) - two possible colors
two bits per pixel (00 to 11) - four possible colors
three bits per pixel (000 to 111) - eight possible colors
four bits per pixel (0000 to 1111) - 16 possible colors

Example :
An image of height 100, width 300, color depth 16 bits
100 × 300 = 30,000
30,000 × 16 = 4,80,000 bits
4,80,000 bits ÷ 8 = 60,000 bytes
60,000 ÷ 1000 = 60 kilobytes
Result : 60KB

ASCII

One of the most common character encoding formats for text data in computers and on the internet is called ASCII. The full form of ASCII is **Americal Standard Code for Information Interchange**. You will get unique values for **128 alphabetic, numeric, or special additional characters and control codes** in standard ASCII-encoded data.

The ASCII encoding is used for telegraph data as it is based on character encoding. It was first published as a standard for computing in 1963 by the American National Standards Institute.
Here, you have the characters including upper and lowercase letters A to Z, numerals 0 to 9, and the main punctuation symbols. Even some non-printing control characters, originally intended for use with teletype printing terminals, are used by it.
One could represent the ASCII characters in the following ways:

- In the form of pairs of hexadecimal digits -- base-16 numbers, which are represented as 0 through 9 and A through F for the decimal values of 10-15;
- In the form of three-digit octal (base 8) numbers;n the form of decimal numbers from 0 to 127; or
- In the form of a 7-bit or 8-bit binary.

For instance, the ASCII encoding for the character "m" is represented in the following ways:

Character	**Hexadecimal**	**Octal**	**Decimal**	**Binary (7-bit)**	**Binary (8-bit)**
m	0x6D	/155	109	110 1101	0110 1101

Why is ASCII important?
ASCII is known to be the first significant character encoding standard for data processing. Unicode Worldwide character Standard a.k.a Unicode, which is a character encoding standard that includes ASCII encodings is used by most modern computer systems.

```
!"#$%&'()*+,-./012
3456789:;<=>?@ABCDE
FGHIJKLMNOPQRSTUVWX
YZ[\]^_`abcdefghijk
lmnopqrstuvwxyz{|}~
```

ASCII was adopted as the standard for internet data when it published "ASCII format for Network Interchange" as RFC20 in 1969, by The Internet Engineering Task Force (IETF). The request for comments (RFC) was accepted as a full standard in 2015.
Today, almost all computers use ASCII or Unicode encoding.

The binary value of the capital letter "A" is represented by:
0100 0001
The binary value of the capital letter "a" is represented by:
0110 0001
The third most significant bit is the difference. In hexadecimal and decimal, this comes down to:

Character	Binary	Decimal	Hexadecimal
A	0100 0001	65	0x41
a	0110 0001	97	0x61

You will see that the difference between the uppercase and lowercase characters is always 32, thus if you are converting uppercase to lowercase or vice-versa you will just have to add or subtract 32 from the ASCII character code.
ASCII advantages and disadvantages
The advantages and disadvantages of ASCII character encoding are very well understood today, after being used for more than half a century.
Advantages

- **ASCII is universally accepted**.
- **Compact character encoding**. As the standard codes can be expressed in 7 bits it doesn't require much data.
- **Efficient for programming**.

Disadvantages

- **Limited character set**.
- **Inefficient character encoding**.

Frequently Asked Questions(FAQs)
1. Why is ASCII used?
ASCII is used to represent text in computers and other devices that use digital communication. It provides a standard way to encode characters, such as letters, numbers, and symbols, using binary code, which can be interpreted by different machines
2. What ASCII means?
ASCII stands for American Standard Code for Information Interchange.

3. What is ASCII and its uses?
ASCII is a character encoding standard that assigns a unique numeric value to each character. It is widely used in computing and telecommunications to represent text. ASCII is used for data exchange between different computer systems, as well as for communication with devices such as printers and modems.
4. What are he 2 types of ASCII?
There is only one type of ASCII, but there are two subsets of ASCII: standard ASCII and extended ASCII. Standard ASCII uses 7 bits to represent characters, while extended ASCII uses 8 bits to represent additional characters.
5. Is ASCII 7 or 8 bits?
Standard ASCII uses 7 bits to represent characters, while extended ASCII uses 8 bits to represent additional characters.

ISO

ISO stands for **International Organization for Standardization** but it isn't what the .iso file extension stands for. The extension was derived out standard patented by the International Organization for Standardization, for filesystems in optical (CD/DVD) disks. The file system standard is under the name **ISO 9660**, where the former term is used as the extension .iso for CD/DVD disk image files. But, ISO files represented with the .iso extension isn't mandatory, as ISO files with file extensions such as .img, .udf also exists. ISO files are also referred to as *image files* as they use the exact format as a disk and could be mounted on one's operating system as if it were a discrete disk. An ISO image is an archive file of an optical disc, a type of disk image composed of the data contents from every written sector on an optical disc, including the optical disc file system.

Characteristics of an ISO Image

ISO image format is uncompressed, containerless, and are stored in binary format. They are a sector-by-sector copy of the contents of an optical drive. Upon encountering an ISO image, the system expects the binary data of format specified under ISO 9660 or UDF (Universal Disk Format), optical media file system standard. ISO files like a regular file, aren't opened, but rather they are mounted (as if they are a volume/device). This behavior is similar to when an operating system recognizes an optical drive. When ISO images are created from optical disks, then ISO files store only the user data from each sector on an optical disc, ignoring the control headers and error correction data, and are therefore slightly smaller than a raw disc image of optical media. The file format isn't exclusive to CD/DVD drives, as one could create an ISO image file with custom files, where the ISO would act as a Physical Disk Drive when mounted.

Advantages of ISO

- Allows quick access of files contained within, as the file is mounted (as opposed to other similar formats where contents need to be extracted).
- Gives deception of a virtual drive, and therefore could be used as a backward compatibility option for the application that requires a disk drive
- Most operating systems provide native support for ISO image files, therefore no utility is required for using this file format

Disadvantages of ISO

- The files inside an ISO image could be edited, but the whole ISO needs to be recompiled again which is time-consuming (as opposed to other formats such as ZIP, etc)
- Performance may not be the most optimal, as the file format follows as optical drive structure which isn't much efficient
- No significant error resilience or integrity preserving protocols are enforced in the format
- Small corruption in any sector of the data, leads to unmountable ISO image files (since the file must be mounted in order to access the data inside, it consequently leads to the data becoming unreadable or not accessible).

Applications of ISO

- ISO image files are used in emulating a optical drives in Video Game Console emulators such as RPCS3, PCSX2, Zenia, PPSSPP etc
- The format is used extensively for storing copies of Operating systems like Windows, linux, Disk Operating System (DOS) etc.
- Used by backup programs to create backup disks

The Importance of ISO Standards:

ISO standards provide a universal language for quality and safety across industries and technologies. These standards ensure that products and services meet the required quality and safety standards, reducing risks and improving customer satisfaction. ISO standards also provide a common framework for businesses and governments to develop and implement management systems, enhancing efficiency, and reducing costs.

ISO Standards for Different Industries:

ISO has developed standards for various industries, including manufacturing, agriculture, healthcare, information technology, and finance. For example,

- The ISO 9001 standard outlines requirements for quality management systems.
- ISO 14001 standard sets standards for environmental management systems.
- ISO 45001 is the latest standard for occupational health and safety management systems, helping organizations to ensure the health and safety of their employees.

The Benefits of ISO Certification:

Organizations can get certified to ISO standards by undergoing an external audit from an accredited certification body. ISO certification demonstrates that an organization meets international standards for quality, safety, and efficiency, enhancing its reputation and credibility. ISO certification also enables organizations to expand their business globally, as ISO standards are recognized worldwide.

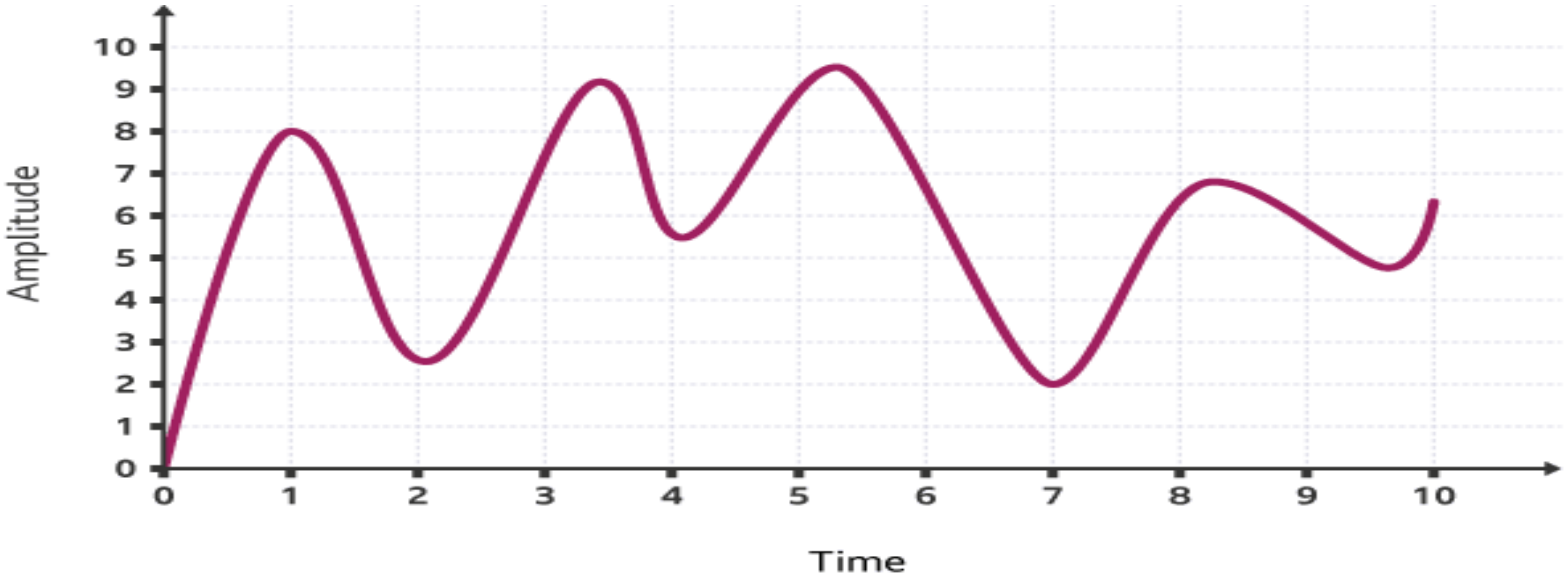
Data representation

All data is represented as binary digits, whether it is numbers, text, images or sound. Calculations are also done in binary.

Sound

Computers work in binary. All data must be converted into binary in order for a computer to process it. Sound is no exception. To do this, sound is captured - usually by a microphone - and then converted into a digital signal.

An analogue-to-digital converter will capture a sound wave at regular time intervals. This recording is known as a sample.
For example, a sound wave like this can be sampled at each time sample point:



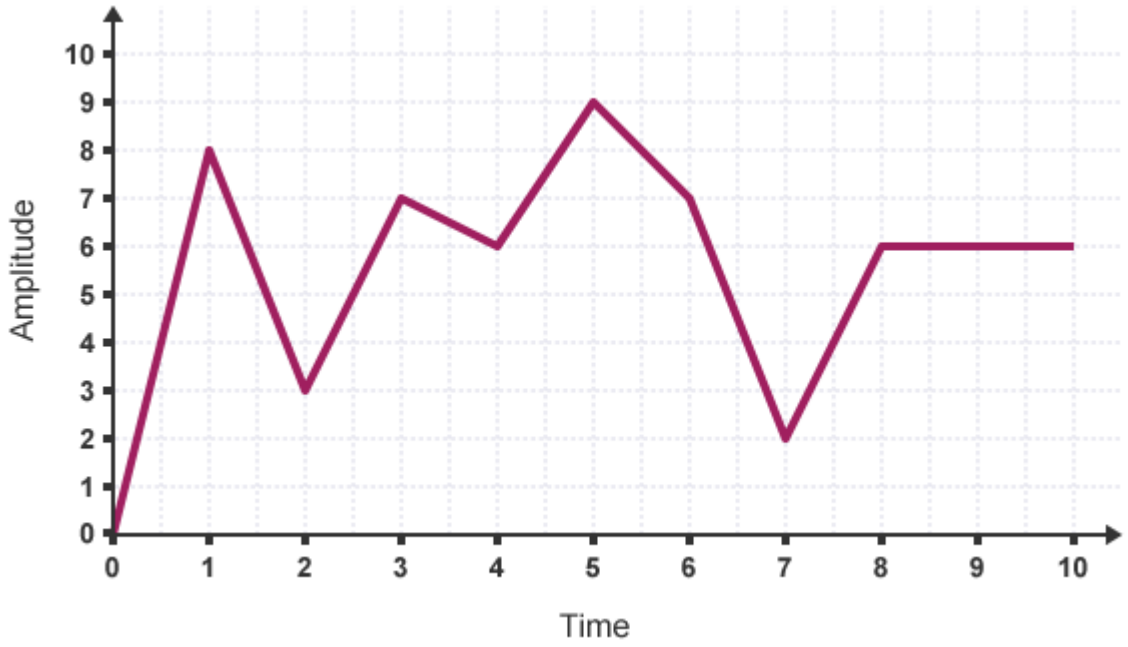
The sound recorded at each sample point is converted to its nearest numeric equivalent:

Sample	1	2	3	4	5	6	7	8	9	10
Denary	8	3	7	6	9	7	2	6	6	6
Binary	1000	0011	0111	0110	1001	0111	0010	0110	0110	0110

This data is then stored in a file for later use.

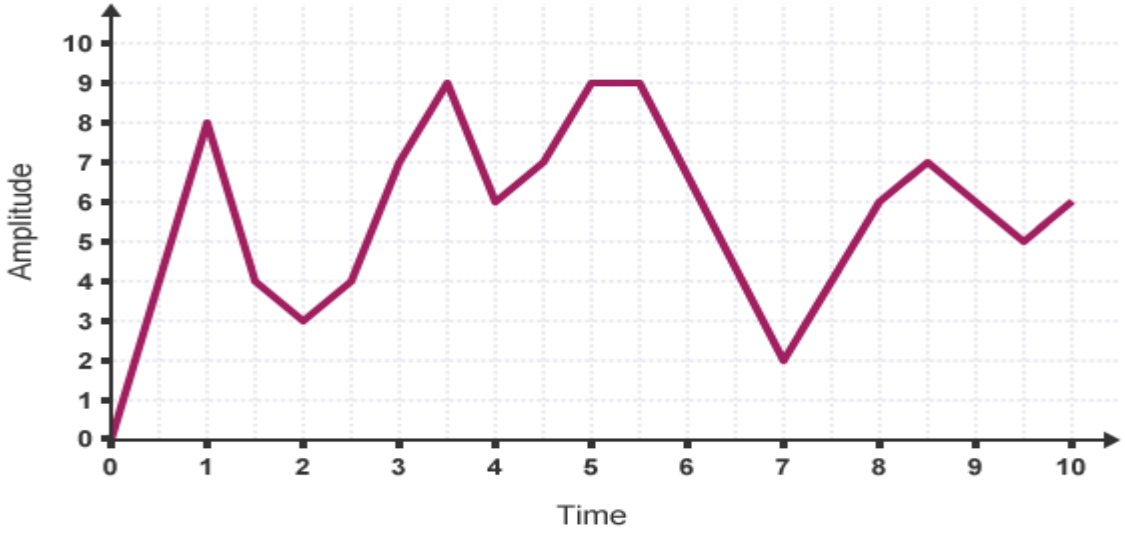
Sample rate

Sample rate is the number of samples recorded in any given period of time. The higher the sample rate, the closer the recorded signal is to the original. Sample rate is measured in hertz.
If the samples recorded above were plotted on a graph, the resulting representation of the sound wave would not be too accurate:



A sound wave plotted from 10 samples

However, if the sample rate is doubled - twice as many samples in the same time period - the resulting representation would be closer:



A sound wave plotted from 20 samples

However, the higher the sample rate, the larger the resulting file. As a result, sound files are often a compromise between quality and size of file. An audio file is usually recorded at 44.1 kilohertz. This is high enough for good sound quality while keeping file size down to sensible levels.

Bit depth

Bit depth refers to the number of bits used to record each sample. Just as with images, the higher the bit depth, the more accurately a sound can be recorded, but the larger the file size. Typical bit depths are 16 bit and 24 bit.

Bit rate

Bit rate is simply a measure of how much data is processed for each second of sound. Bit rate is calculated by:

Sample rate × bit depth

As with sample rate, the higher the bit rate, the better quality of the recorded sound.

Bit depth refers to the number of bits used to record each sample. Bit rate is a measure of how much data is processed for each second of sound.