Hillingdon U3A Computer Group

DATA

(Introduction)

U3A Presentation

J. Martin 2019

Computer data is information that has been converted into a digital format for processing and storing by a computer.

Text

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Today's Date
Ms Gill Cooper
OxfAID
123 Main Street
New York, NY 1001

Re: Fundraising Officer #A22714

I wish to apply for the post of Fundraising Officer which I saw advertised on the Oxford University Careers Service website. I am in my final year at Oxford University, studying Mathematics. I have a long-standing interest in charity work and believe that I have the qualities and experience required to be a successful fundraiser.

My enthusiasm for pursuing a career in this area stems from my interest in working with disadvantaged young people, and my desire to make full use of my skills in motivating people to make a difference. OxfAID has established its credentials working in some of the most challenging areas of social aid and the government funding recently awarded to the organization is recognition of the success of its philosophy. After my experiences with Jacari, I am attracted by the opportunity to help other young people and to develop my fundraising skills in such an environment.

Motivating people to work with me towards a common, worthwhile goal is something that I find hugely enjoyable and rewarding. As Marketing and Publicity Officer for the College Ball last year I was extremely pleased that we had more applicants for tickets than ever before. I believe that the marketing pack that I put together for potential sponsors played its part in attracting record levels of sponsorship.

One of the most rewarding aspects of being at Oxford has been the work I have done with Jacari. During my time on the committee the number of volunteers involved in the project has increased by 50% and I have enjoyed both the challenge of raising the profile of the society and my work with young people themselves.

I would welcome the opportunity to discuss my application with you and look forward to hearing from you.

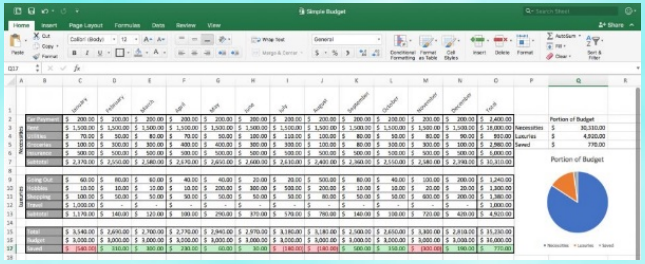
Yours sincerely,
Your name

Sounds

Video

Image

Financial



How does a computer hold data?

Computers use electricity to work.

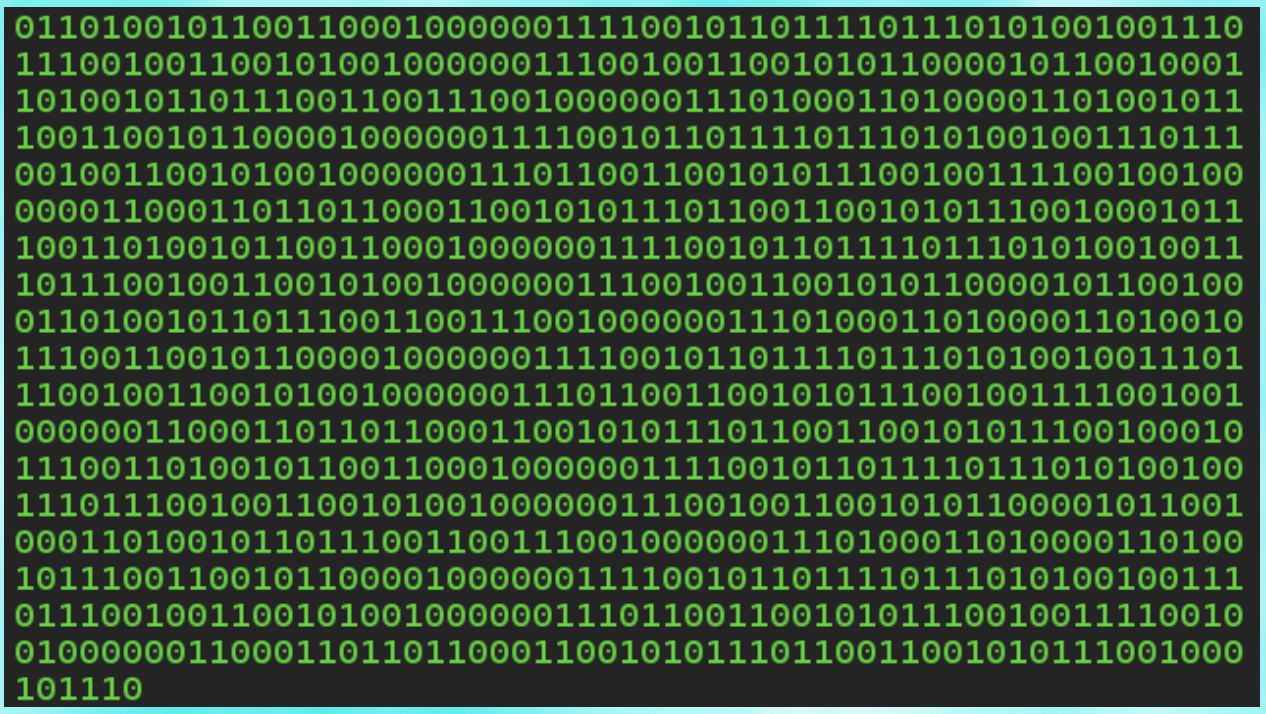
Electricity in a circuit can have one of two states:

- Not Flowing (OFF)
- Flowing (ON)

In a computer’s electronic circuit

- OFF state represents a 0 (zero)
- ON state represents a 1 (one)

This is called a **BIT**.



But if a BIT can only hold:

0 or **1**

How can you store data such as letters, numbers, sounds, images……?

TEXT

Morse code had already been developed as a method of transmitting text information using two values such as a series of on-off tones, lights, or clicks .

A	·−	N	−·
B	−···	O	−−−
C	−·−·	P	·−−·
D	−··	Q	−−·−
E	·	R	·−·
F	··−·	S	···
G	−−·	T	−
H	····	U	··−
I	··	V	···−
J	·−−−	W	·−−
K	−·−	X	−··−
L	·−··	Y	−·−−
M	−−	Z	−−··
0	−−−−−	5	·····
1	·−−−−	6	−····
2	··−−−	7	−−···
3	···−−	8	−−−··
4	····−	9	−−−−·
PERIOD	·−·−·−		
COMMA	−−··−−		

As a Computer BIT can hold

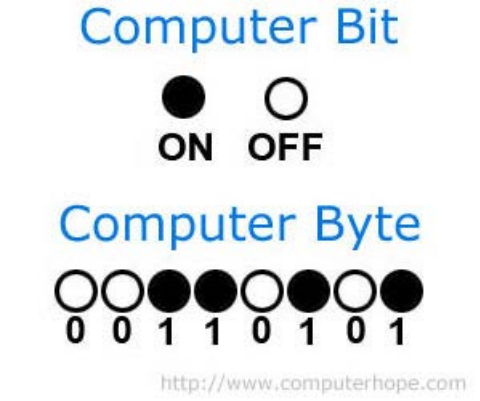
0 (zero) or **1** (one)

instead of Morse Code the Binary numbering system is used

Base 2

Number	Binary equivalent
0	000000
1	000001
2	000010
3	000011
4	000100
5	000101
6	000110
7	000111
8	001000
9	001001
10	001010
11	001011
12	001100
13	001101
14	001110
15	001111

In Computers to allow data other than 0 and 1, the Bits are usually assembled into a group of **eight** to form a **byte**.



Using the Binary numbering system this allows the Byte to hold values from 0 to 255.

The 256 decimal values (0-255) of a Byte can be used to represent any single character, such as a lower case or upper case alphabetic letter, a number, a punctuation mark……..

American Standard Code for Information Interchange

ASCII was developed in 1963 and is a standard that assigns letters, numbers, and other characters to the 128 possible decimal values of using 7 bits of the byte.

ASCII TABLE

Decimal	Hex	Char	Decimal	Hex	Char	Decimal	Hex	Char	Decimal	Hex	Char
0	0	[NULL]	32	20	[SPACE]	64	40	@	96	60	`
1	1	[START OF HEADING]	33	21	!	65	41	A	97	61	a
2	2	[START OF TEXT]	34	22	"	66	42	B	98	62	b
3	3	[END OF TEXT]	35	23	#	67	43	C	99	63	c
4	4	[END OF TRANSMISSION]	36	24	$	68	44	D	100	64	d
5	5	[ENQUIRY]	37	25	%	69	45	E	101	65	e
6	6	[ACKNOWLEDGE]	38	26	&	70	46	F	102	66	f
7	7	[BELL]	39	27	'	71	47	G	103	67	g
8	8	[BACKSPACE]	40	28	(	72	48	H	104	68	h
9	9	[HORIZONTAL TAB]	41	29	)	73	49	I	105	69	i
10	A	[LINE FEED]	42	2A	*	74	4A	J	106	6A	j
11	B	[VERTICAL TAB]	43	2B	+	75	4B	K	107	6B	k
12	C	[FORM FEED]	44	2C	,	76	4C	L	108	6C	l
13	D	[CARRIAGE RETURN]	45	2D	-	77	4D	M	109	6D	m
14	E	[SHIFT OUT]	46	2E	.	78	4E	N	110	6E	n
15	F	[SHIFT IN]	47	2F	/	79	4F	O	111	6F	o
16	10	[DATA LINK ESCAPE]	48	30	0	80	50	P	112	70	p
17	11	[DEVICE CONTROL 1]	49	31	1	81	51	Q	113	71	q
18	12	[DEVICE CONTROL 2]	50	32	2	82	52	R	114	72	r
19	13	[DEVICE CONTROL 3]	51	33	3	83	53	S	115	73	s
20	14	[DEVICE CONTROL 4]	52	34	4	84	54	T	116	74	t
21	15	[NEGATIVE ACKNOWLEDGE]	53	35	5	85	55	U	117	75	u
22	16	[SYNCHRONOUS IDLE]	54	36	6	86	56	V	118	76	v
23	17	[ENG OF TRANS. BLOCK]	55	37	7	87	57	W	119	77	w
24	18	[CANCEL]	56	38	8	88	58	X	120	78	x
25	19	[END OF MEDIUM]	57	39	9	89	59	Y	121	79	y
26	1A	[SUBSTITUTE]	58	3A	:	90	5A	Z	122	7A	z
27	1B	[ESCAPE]	59	3B	;	91	5B	[	123	7B	{
28	1C	[FILE SEPARATOR]	60	3C	<	92	5C	\	124	7C	|
29	1D	[GROUP SEPARATOR]	61	3D	=	93	5D	]	125	7D	}
30	1E	[RECORD SEPARATOR]	62	3E	>	94	5E	^	126	7E	~
31	1F	[UNIT SEPARATOR]	63	3F	?	95	5F	_	127	7F	[DEL]

Extended ASCII uses eight instead of seven bits, which adds 128 additional characters. This gives extended ASCII the ability for extra characters, such as special symbols, foreign language letters, and drawing characters

Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
128	80	Ç	160	A0	á	192	C0	└	224	E0	α
129	81	ü	161	A1	í	193	C1	┴	225	E1	ß
130	82	é	162	A2	ó	194	C2	┬	226	E2	Γ
131	83	â	163	A3	ú	195	C3	├	227	E3	π
132	84	ä	164	A4	ñ	196	C4	─	228	E4	Σ
133	85	à	165	A5	Ñ	197	C5	┼	229	E5	σ
134	86	å	166	A6	ª	198	C6	╞	230	E6	µ
135	87	ç	167	A7	º	199	C7	╟	231	E7	τ
136	88	ê	168	A8	¿	200	C8	╚	232	E8	Φ
137	89	ë	169	A9	⌐	201	C9	╔	233	E9	Θ
138	8A	è	170	AA	¬	202	CA	╩	234	EA	Ω
139	8B	ï	171	AB	½	203	CB	╦	235	EB	δ
140	8C	î	172	AC	¼	204	CC	╠	236	EC	∞
141	8D	ì	173	AD	¡	205	CD	═	237	ED	ø
142	8E	Ä	174	AE	«	206	CE	╬	238	EE	ε
143	8F	Å	175	AF	»	207	CF	╧	239	EF	∩
144	90	É	176	B0	░	208	D0	╨	240	F0	≡
145	91	æ	177	B1	▒	209	D1	╤	241	F1	±
146	92	Æ	178	B2	▓	210	D2	╥	242	F2	≥
147	93	ô	179	B3	│	211	D3	╙	243	F3	≤
148	94	ö	180	B4	┤	212	D4	╘	244	F4	⌠
149	95	ò	181	B5	╡	213	D5	╒	245	F5	⌡
150	96	û	182	B6	╢	214	D6	╓	246	F6	÷
151	97	ù	183	B7	╖	215	D7	╫	247	F7	≈
152	98	ÿ	184	B8	╕	216	D8	╪	248	F8	°
153	99	Ö	185	B9	╣	217	D9	┘	249	F9	∙
154	9A	Ü	186	BA	║	218	DA	┌	250	FA	·
155	9B	¢	187	BB	╗	219	DB	█	251	FB	√
156	9C	£	188	BC	╝	220	DC	▄	252	FC	ⁿ
157	9D	¥	189	BD	╜	221	DD	▌	253	FD	²
158	9E	₧	190	BE	╛	222	DE	▐	254	FE	■
159	9F	ƒ	191	BF	┐	223	DF	▀	255	FF	

So the word “Soft” will require 4 bytes (32 bits) to store it:

S (83)

128	64	32	16	8	4	2	1
0	1	0	1	0	0	1	1

o (111)

128	64	32	16	8	4	2	1
0	1	1	0	1	1	1	1

f (102)

128	64	32	16	8	4	2	1
0	1	1	0	0	1	1	0

t (116)

128	64	32	16	8	4	2	1
0	1	1	1	0	1	0	0

So BYTES can be used to store information

Units of Computer Memory Measurements

1 Bit	= Binary Digit
8 Bits	= 1 Byte
1024 Bytes	= 1 KB [Kilo Byte]
1024 KB	= 1 MB [Mega Byte]
1024 MB	= 1 GB [Giga Byte]
1024 GB	= 1 TB [Terra Byte]
1024 TB	= 1 PB [Peta Byte]
1024 PB	= 1 EB [Exa Byte]
1024 EB	= 1 ZB [Zetta Byte]
1024 ZB	= 1 YB [Yotta Byte]
1024 YB	= 1 Bronto Byte
1024 Brontobyte	= 1 Geop Byte

Geop Byte is the Highest Memory.

Why is a Kilo Byte 1024 bytes instead of 1000 bytes?

It is because computers use binary instead of a decimal system.

(0, 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024)

Different types of data are stored in different bit formats

DIGITAL IMAGE

The term "digital image" usually refers to a raster image or bitmapped image.

A pixel is generally thought of as the smallest single component of a Raster image.

The number of distinct colours that can be represented by a pixel depends on the number of **bits per pixel** (bpp).

A 1 bpp image uses 1-bit for each pixel.
Each additional bit doubles the number of colours available:

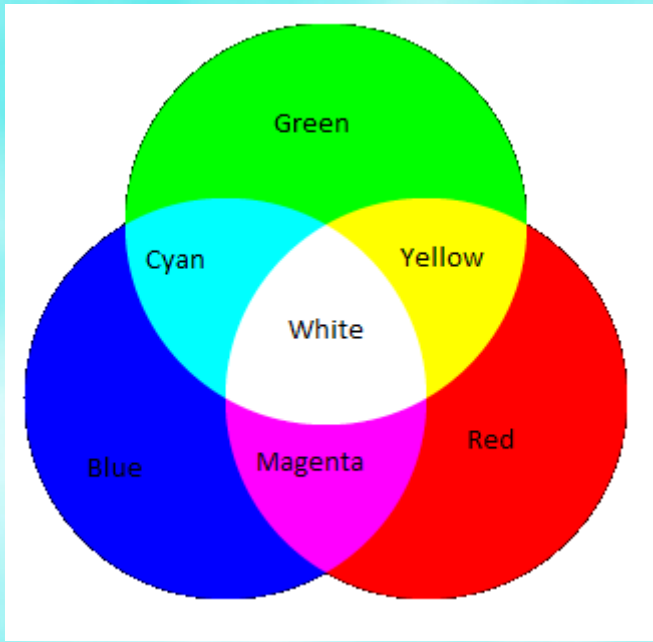
1 bpp = 2 colours (monochrome)
2 bpp = 4 colours
3 bpp = 8 colours

8 bpp = 256 colours
16 bpp = 65,536 colours ("Highcolor")
24 bpp = 16,777,216 colours ("Truecolor")

RGB Colour Model

This uses 24 bpp which can represent 16,777,216 colours.

8 bits are used with a value of 0 to 255 to represent different shades of each of the primary colours **R**ed, **G**reen and **B**lue.



RGB(255, 0, 0)

RGB(0, 255, 0)

RGB(0, 0, 255)

RGB(120, 0, 0)

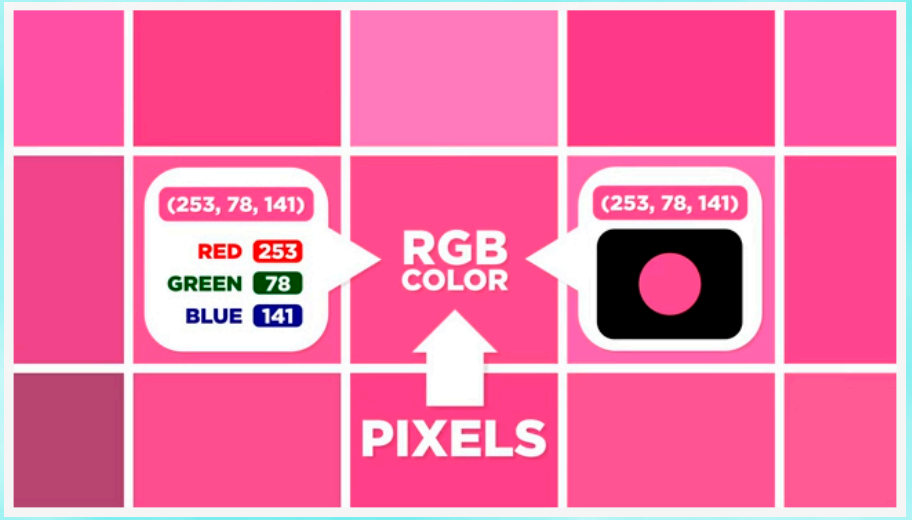
RGB(0, 120, 0)

RGB(0, 0, 120)

RGB(0, 0, 0)

RGB(255, 255, 255)

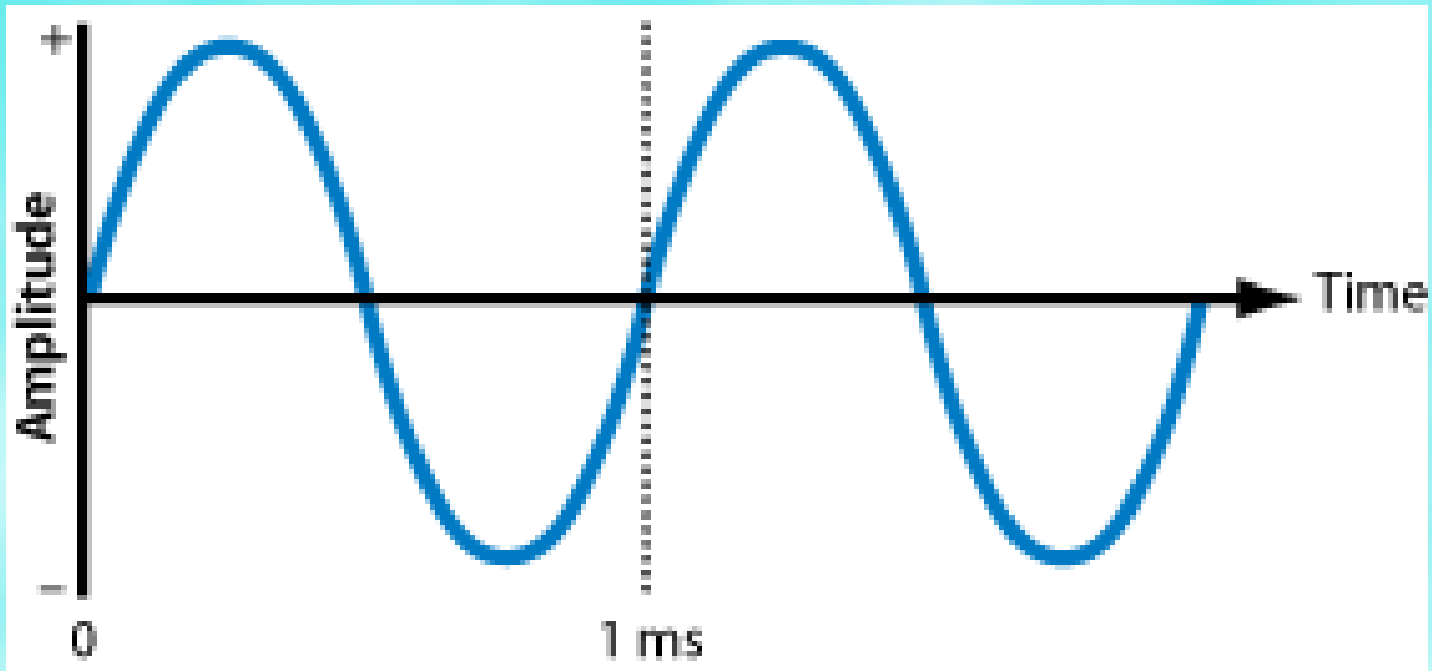
RGB(120, 120, 120)



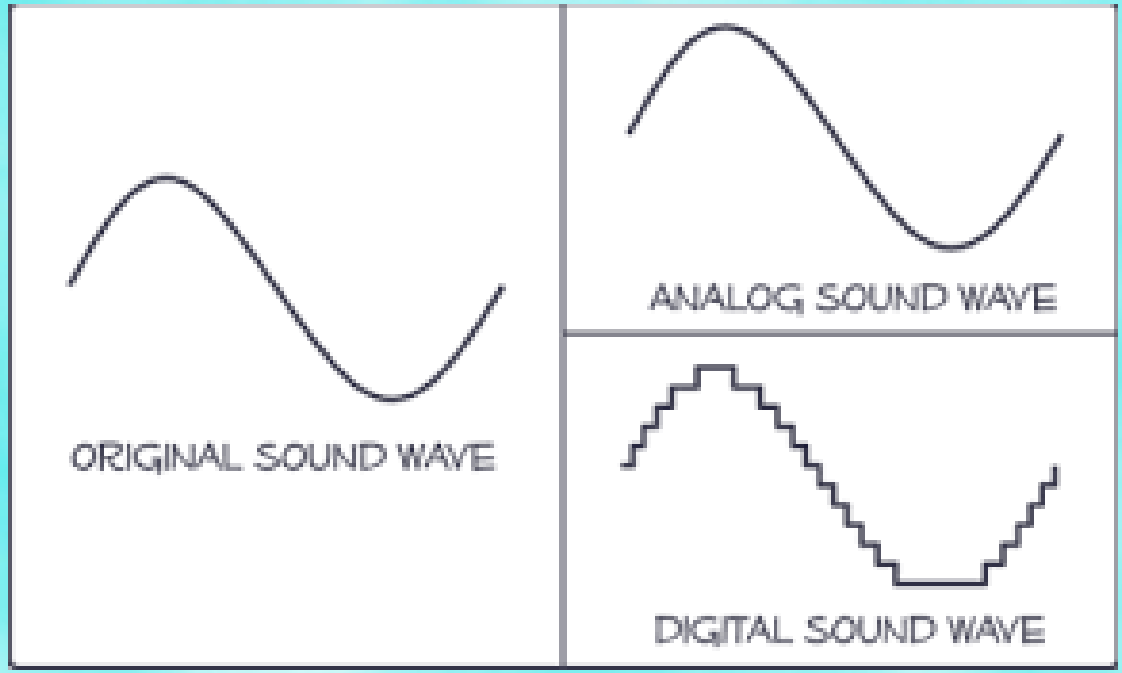
Typical RGB devices are colour TVs, video cameras, image scanners, and digital cameras.

DIGITAL AUDIO

Sound itself is a continuous wave; it is an analog signal. This means that one cannot detect the precise moment the pitch changes.



Therefore, audio and video signals must be converted to a digital (binary) format in order to be stored on a computer or saved to a CD or DVD.



As audio is digitized, two factors come into play: **sampling rate** and **bit depth**.

Sampling Rate

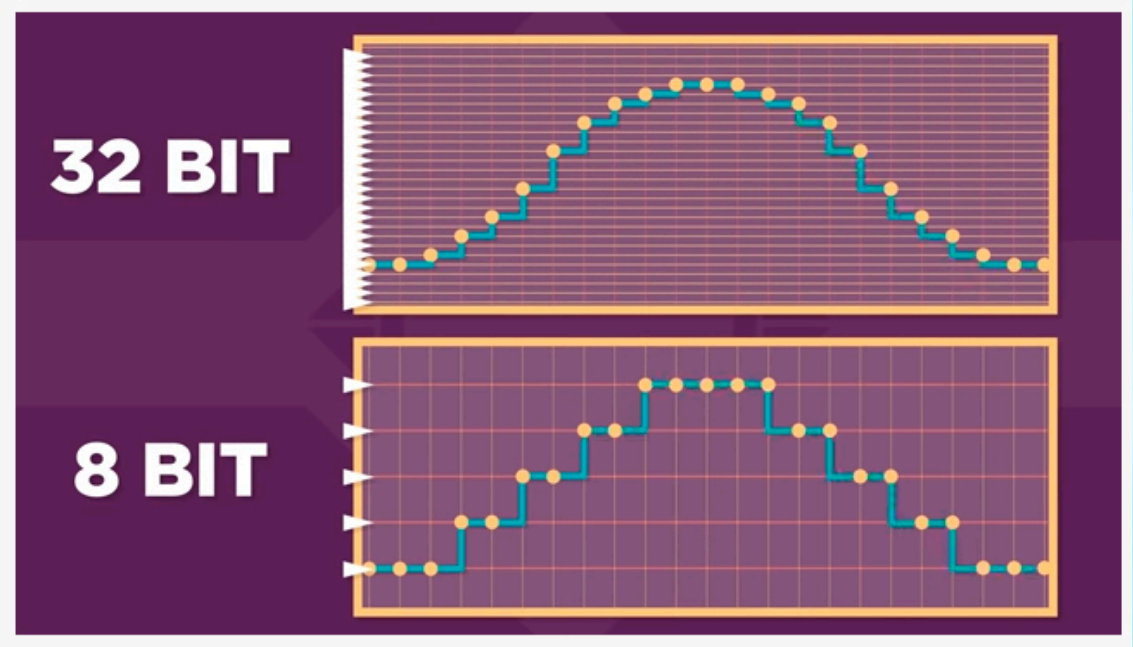
Sampling rate is how many times per second audio is sampled to convert it into a digital file.

From this, we get the term “samples per second,” which is usually expressed in kiloHertz (kHz), which means 1,000 times each second.
The more samples per second, the better the audio quality.

44.1 kHz is the current standard for most consumer music applications.

Bit Depth

Bit depth is the number of bits available for each sample. The higher the bit depth, the higher the quality of the audio. Bit depth is usually 16 bits on a CD and 24 bits on a DVD.



A *computer file* is a resource for storing Data

A file can be defined as a collection of related records that give a complete set of information about a certain item or entity. (Document, spreadsheet, digital image, Video, music….

A file is usually stored on digital media such as a Disc drive, CD, DVD, USB stick. Magnetic Tape

A **File** is processed by a Computer Programme.

Programmes (WORD, EXCEL, PAINT…) are written to process only specific type of Data (Video, Picture, document etc..)

Programmes therefore need to know that the data in a file is of the type it can process.

This technical format is defined as a **File Type**.

Below are some sample MS Windows File Types (Extensions):

File Extension	Type of File	Typical Software Used to Access
.txt	Text only	Notepad
.docx	Document processing	Microsoft Word
.pdf	Portable document file	Adobe Reader
.png	Image	Paint
.jpg or .jpeg	Image	Paint
.tif	Image	Paint
.wav	Audio	Windows Media Player
.mp3	Audio	Windows Media Player
.mp4	Video	Windows Media Player
.gif	Animation	Internet Browser
.avi	Video	Windows Media Player
.xls	Spreadsheet	Microsoft Excel
.zip	Compressed Folder	Operating System manager
.wmv	Video	Windows Media Player
.ppt	Slideshow	Microsoft PowerPoint
.pub	Publication	Microsoft Publisher
.mov	Video	Windows Media Player
.exe	Executable File	Self-Running

You will notice from the previous table that some file types can have multiple File Extensions

For example AUDIO is shown with .WAV and .MP3 extensions.

.wav	Audio	Windows Media Player
.mp3	Audio	Windows Media Player

The **WAV** file is one of the simplest digital audio file formats.

It it capable of recording the entire audible frequency range of 20hz-20khz.

However the large file size of WAVs makes them impractical for portable devices and streaming.

MP3 files are created by removing frequencies the ear cannot hear and quieter sounds that may be masked by louder ones and then uses compression techniques to create a file usually a $1/10^{th}$ the size of a WAV

To compress the file, audio quality is sacrificed and this means the audio inaccuracy is not suitable for professional audio work.