

Bit Shifting:

Logical Shifting:

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

discarded 0	1	1	0	0	1	0	0
1	1	0	0	1	0	0	0

left shift

zero is entered.

$$\begin{array}{r}
 0 \ 1 \ 1 \ 0 \ 0 \ 1 \ 0 \ 0 \quad 100 \\
 1x \quad 1 \ 1 \ 0 \ 0 \ 1 \ 0 \ 0 \quad 200 \times 2
 \end{array}$$

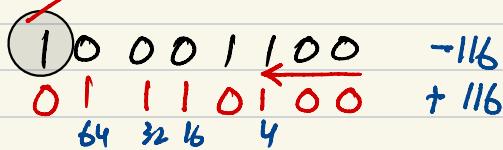
$$\begin{array}{r}
 0 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1 \ 0 \quad 50 \\
 2x \quad 0 \ 1 \ 1 \ 0 \ 0 \ 1 \ 0 \ 0 \quad 100 \times 2 \\
 2x \quad 1 \ 1 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \quad 200 \times 4 \times 2
 \end{array}$$

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

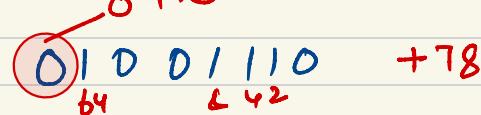
→ 0	0	1	1	0	0	1	0	Discarded	50
→ 0	0	0	1	1	0	0	1	25	25
→ 0	0	0	0	0	1	0	0	12	12

Two's Complement

1 → ve


10001100
64 32 16 4
-116

0 → ve


0100110
64 16 8
+78

-15 → 00001111 ← +15
11110001 ← -15

00000001 ← +3
11111101 ← -3

00000001 ← +1
11111111 ← -1

Addition of two numbers:

two numbers might be: 1) Unsigned numbers.
2) Signed numbers.



Unsigned numbers: Range $0 - 255$



Signed number: Range

$-128 - +127$

$0 - +127$

$$\begin{array}{r} 0 \\ + 0 \\ \hline 100 \end{array}$$

C S

$$\begin{array}{r} 0 \\ + 1 \\ \hline 01 \end{array}$$

C S

$$\begin{array}{r} 1 \\ + 1 \\ \hline 10 \end{array}$$

C S

$2^2 = 4$

0
3

B	D
1	2
2	1
0	0
1	1
1	2
1	3

$$\begin{array}{r} 1 \\ + 1 \\ \hline 11 \end{array}$$

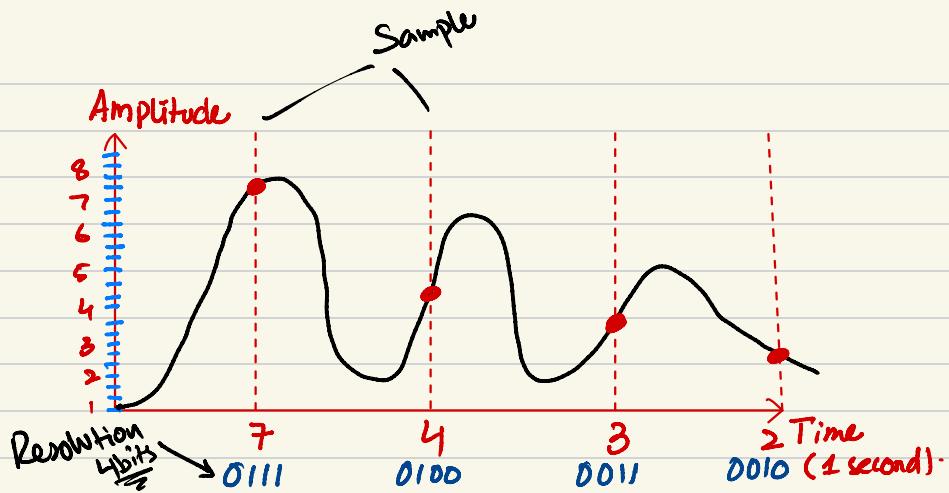
C S

$$\begin{array}{r}
 +5 \\
 +3 \\
 \hline +8
 \end{array} \quad \begin{array}{r}
 00000101 \\
 +00000011 \\
 \hline 00001000
 \end{array}$$

$$\begin{array}{r}
 +50 \\
 +130 \\
 \hline +180
 \end{array} \quad \begin{array}{r}
 00110010 \\
 +10000010 \\
 \hline 10110100
 \end{array}$$

Overflow?	> 255
	11001000
	01100100
	100100100
> 255 ?	overflow.

SOUND



Sample: An individual measurement (recording) of the amplitude of an audio signal at a specific moment in time.

Sample Resolution: Also called bit depth, it represents the number of bits used to save each sample.

Sampling: This is the process of measuring (storing) amplitude (intensity) of an analogue sound wave at regular intervals to convert it into a digital format.

Sample rate: Measured in Hertz (Hz), is the number of samples taken per second from a continuous signal to make it discrete.

Sound file size = Sample rate × Sample resolution × Time in seconds

Data Sizing:

1 bit

2^{10}

2^{20}

2^{30}

8 bits

1024 Bytes

1024 Kib

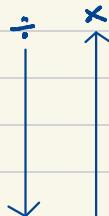
1024 Mib

1 Byte

1 Kibibytes Kib

1 Mebibytes Mib

1 Gibibytes Gib



N bits \rightarrow N Mib

$$N/8 = N \text{ Bytes} / 1024 = N \text{ Kib} / 1024 \\ = N \text{ Mib.}$$

IMAGE

