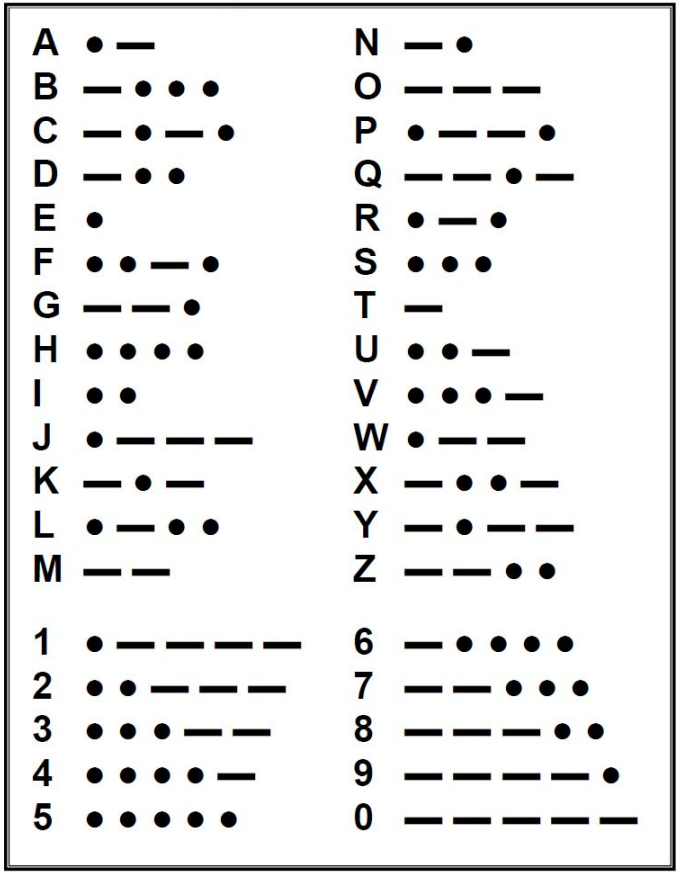
CODE SYSTEMS

MORSE CODE
(ALPHABETICAL)



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representing text

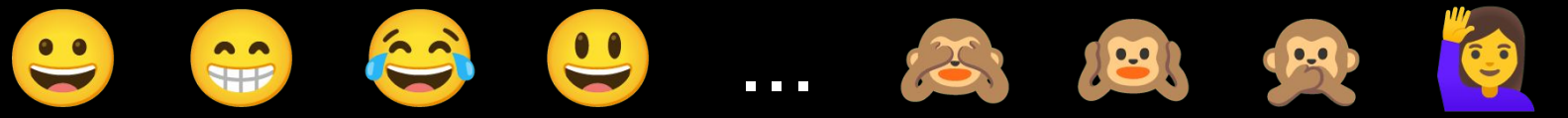
A	B	C	D	...	a	b	c	d
65	66	67	68		97	98	99	100

ASCII Code

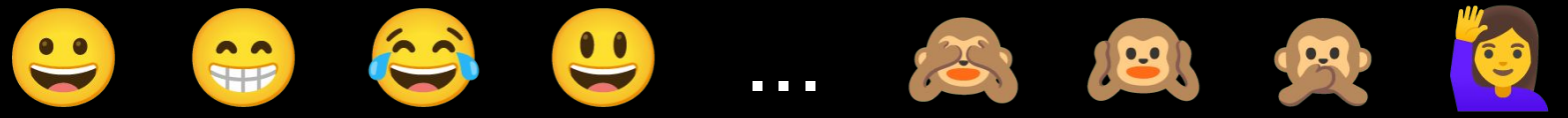
A	B	C	D	...	a	b	c	d
65	66	67	68		97	98	99	100

Decimal	Binary	Octal	Hex	ASCII	Decimal	Binary	Octal	Hex	ASCII	Decimal	Binary	Octal	Hex	ASCII	Decimal	Binary	Octal	Hex	ASCII
0	00000000	000	00	NUL	32	00100000	040	20	SP	64	01000000	100	40	@	96	01100000	140	60	`
1	00000001	001	01	SOH	33	00100001	041	21	!	65	01000001	101	41	A	97	01100001	141	61	a
2	00000010	002	02	STX	34	00100010	042	22	"	66	01000010	102	42	B	98	01100010	142	62	b
3	00000011	003	03	ETX	35	00100011	043	23	#	67	01000011	103	43	C	99	01100011	143	63	c
4	00000100	004	04	EOT	36	00100100	044	24	$	68	01000100	104	44	D	100	01100100	144	64	d
5	00000101	005	05	ENQ	37	00100101	045	25	%	69	01000101	105	45	E	101	01100101	145	65	e
6	00000110	006	06	ACK	38	00100110	046	26	&	70	01000110	106	46	F	102	01100110	146	66	f
7	00000111	007	07	BEL	39	00100111	047	27	'	71	01000111	107	47	G	103	01100111	147	67	g
8	00001000	010	08	BS	40	00101000	050	28	(	72	01001000	110	48	H	104	01101000	150	68	h
9	00001001	011	09	HT	41	00101001	051	29	)	73	01001001	111	49	I	105	01101001	151	69	i
10	00001010	012	0A	LF	42	00101010	052	2A	*	74	01001010	112	4A	J	106	01101010	152	6A	j
11	00001011	013	0B	VT	43	00101011	053	2B	+	75	01001011	113	4B	K	107	01101011	153	6B	k
12	00001100	014	0C	FF	44	00101100	054	2C	,	76	01001100	114	4C	L	108	01101100	154	6C	l
13	00001101	015	0D	CR	45	00101101	055	2D	-	77	01001101	115	4D	M	109	01101101	155	6D	m
14	00001110	016	0E	SO	46	00101110	056	2E	.	78	01001110	116	4E	N	110	01101110	156	6E	n
15	00001111	017	0F	SI	47	00101111	057	2F	/	79	01001111	117	4F	O	111	01101111	157	6F	o
16	00010000	020	10	DLE	48	00110000	060	30	0	80	01010000	120	50	P	112	01110000	160	70	p
17	00010001	021	11	DC1	49	00110001	061	31	1	81	01010001	121	51	Q	113	01110001	161	71	q
18	00010010	022	12	DC2	50	00110010	062	32	2	82	01010010	122	52	R	114	01110010	162	72	r
19	00010011	023	13	DC3	51	00110011	063	33	3	83	01010011	123	53	S	115	01110011	163	73	s
20	00010100	024	14	DC4	52	00110100	064	34	4	84	01010100	124	54	T	116	01110100	164	74	t
21	00010101	025	15	NAK	53	00110101	065	35	5	85	01010101	125	55	U	117	01110101	165	75	u
22	00010110	026	16	SYN	54	00110110	066	36	6	86	01010110	126	56	V	118	01110110	166	76	v
23	00010111	027	17	ETB	55	00110111	067	37	7	87	01010111	127	57	W	119	01110111	167	77	w
24	00011000	030	18	CAN	56	00111000	070	38	8	88	01011000	130	58	X	120	01111000	170	78	x
25	00011001	031	19	EM	57	00111001	071	39	9	89	01011001	131	59	Y	121	01111001	171	79	y
26	00011010	032	1A	SUB	58	00111010	072	3A	:	90	01011010	132	5A	Z	122	01111010	172	7A	z
27	00011011	033	1B	ESC	59	00111011	073	3B	;	91	01011011	133	5B	[	123	01111011	173	7B	{
28	00011100	034	1C	FS	60	00111100	074	3C	<	92	01011100	134	5C	\	124	01111100	174	7C	|
29	00011101	035	1D	GS	61	00111101	075	3D	=	93	01011101	135	5D	]	125	01111101	175	7D	}
30	00011110	036	1E	RS	62	00111110	076	3E	>	94	01011110	136	5E	^	126	01111110	176	7E	~
31	00011111	037	1F	US	63	00111111	077	3F	?	95	01011111	137	5F	_	127	01111111	177	7F	DEL

https://www.eecis.udel.a/~amer/CISC651/ASCII-Conversion-Chart.pdf


1F600
1F601
1F602
1F603
...
1F648
1F649
1F64A
1F64B

Unicode



1F600 1F601 1F602 1F603 ... 1F648 1F649 1F64A 1F64B

hexadecimal

1	A	D
16^2	16^1	16^0

(hexadecimal)

1 A D (hexadecimal)

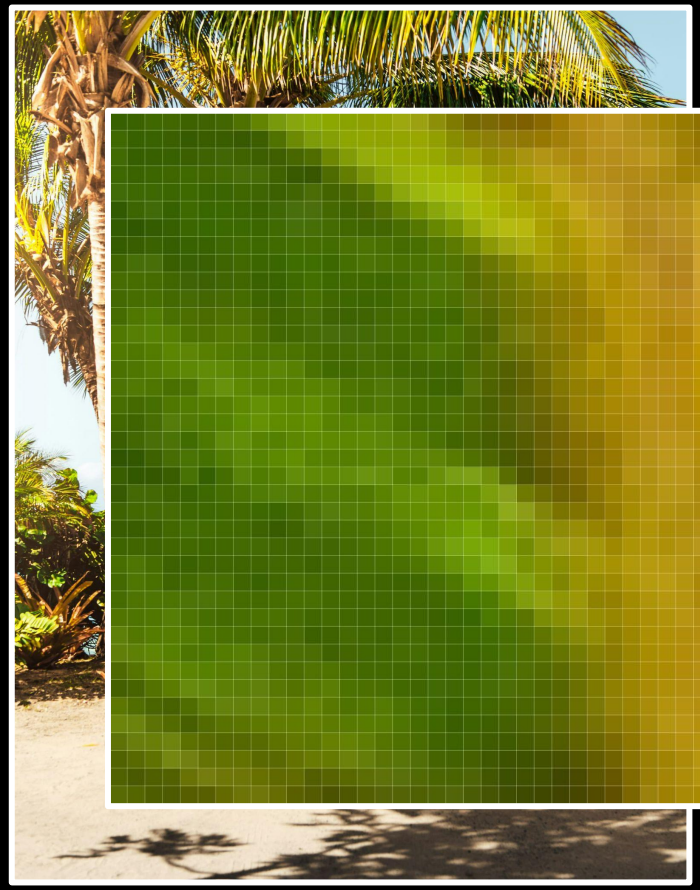
16^2 16^1 16^0

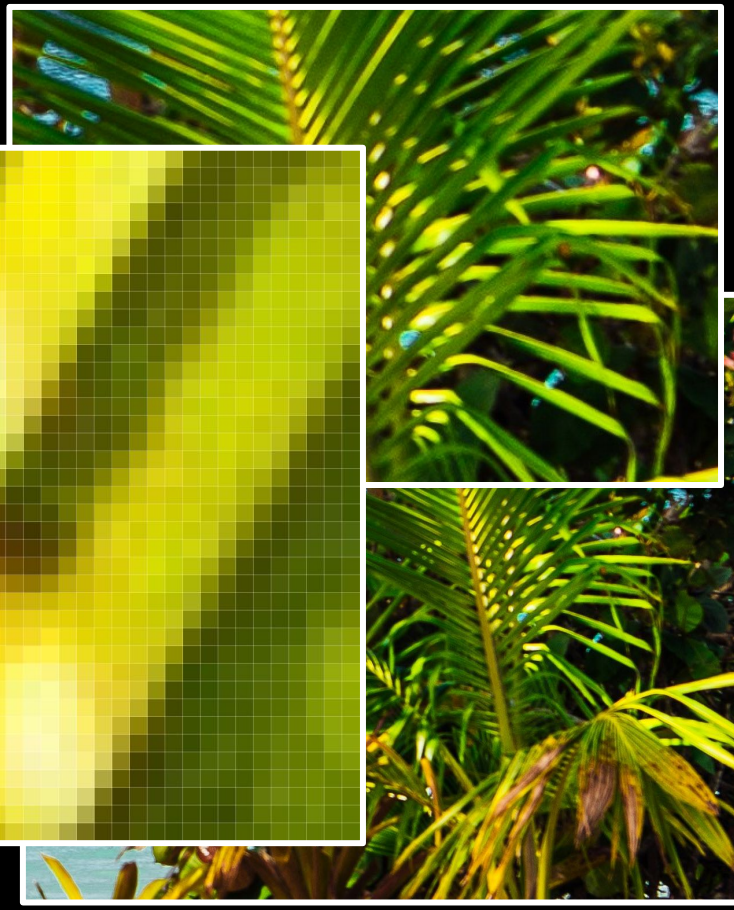
$= 1 \times 16^2 + 10 \times 16^1 + 13 \times 16^0$

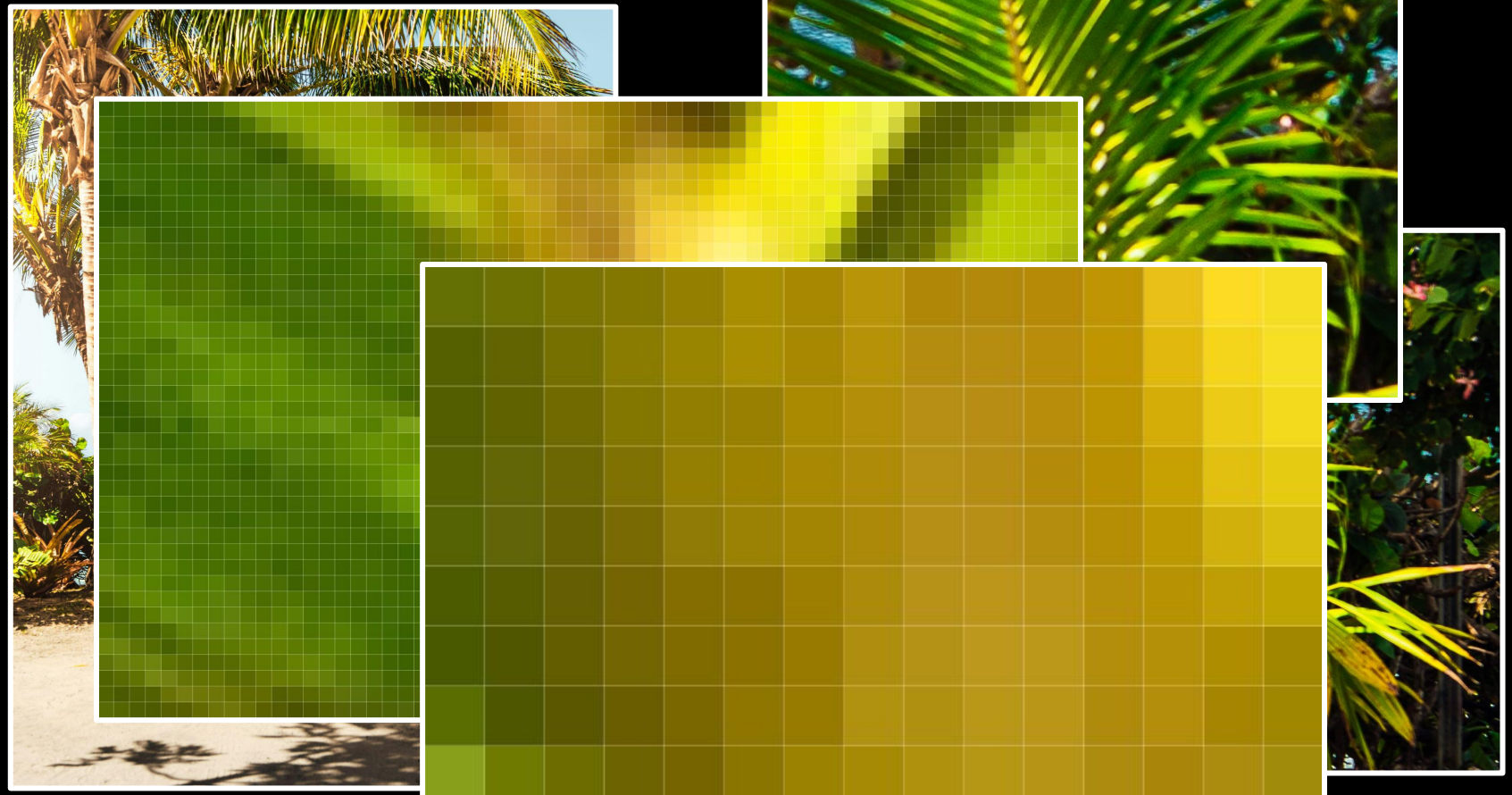
$= 1 \times 256 + 10 \times 16 + 13 \times 1$

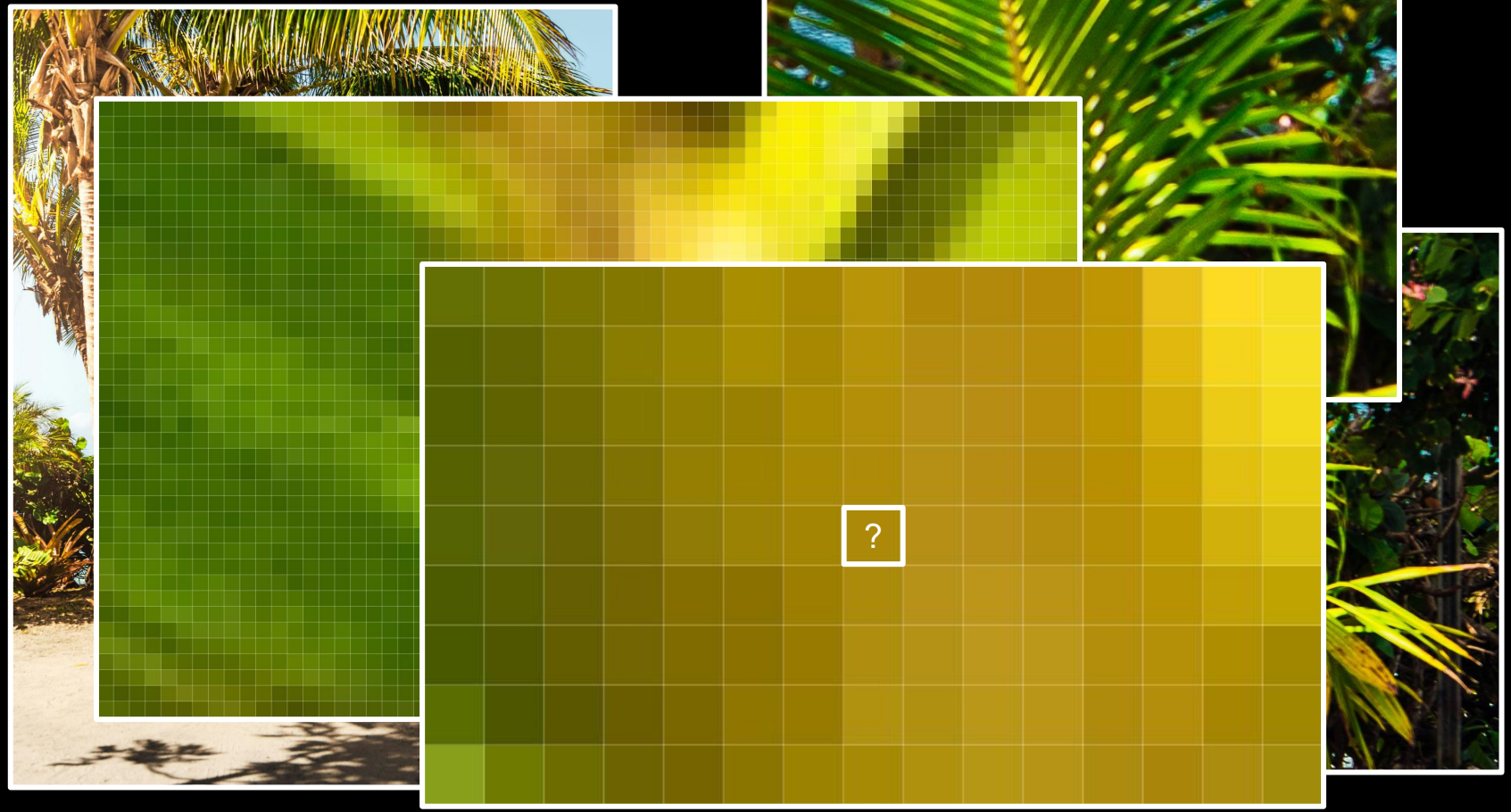
$= 429$ (decimal)

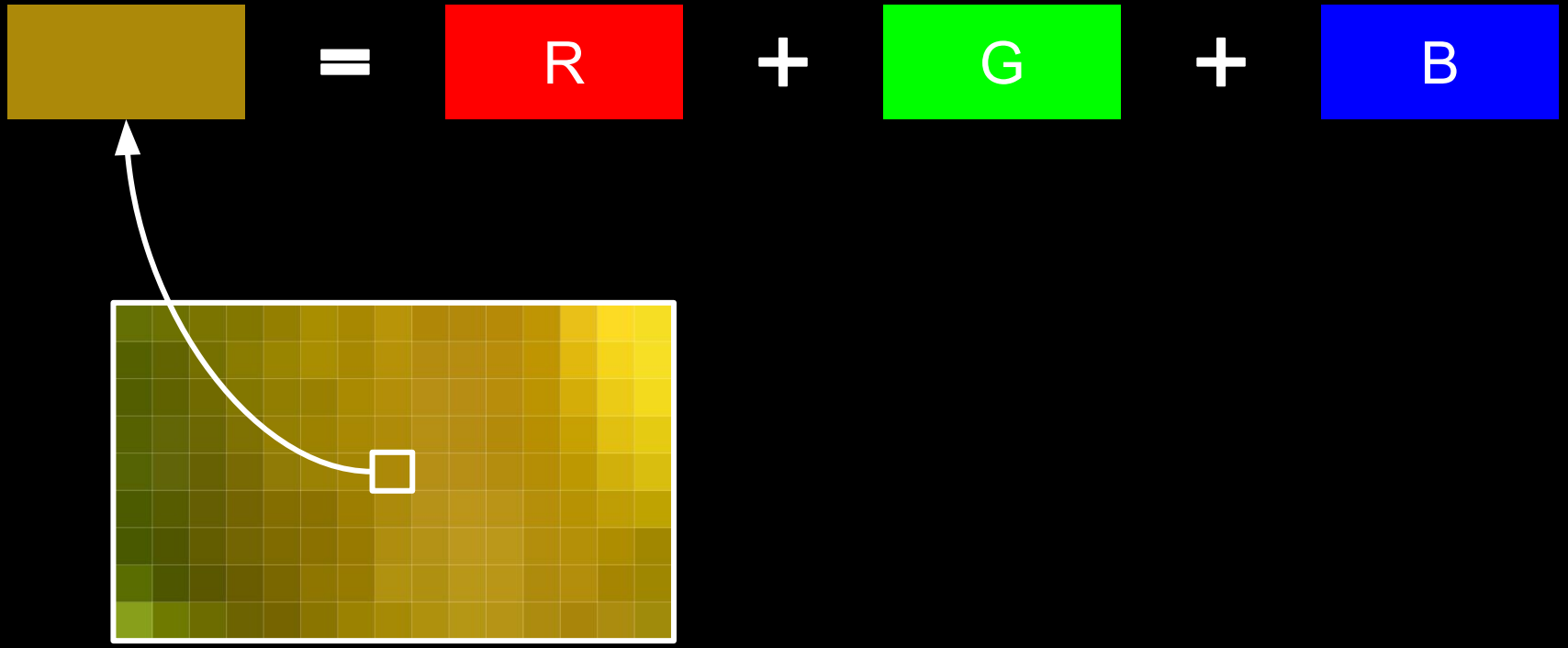
representing images

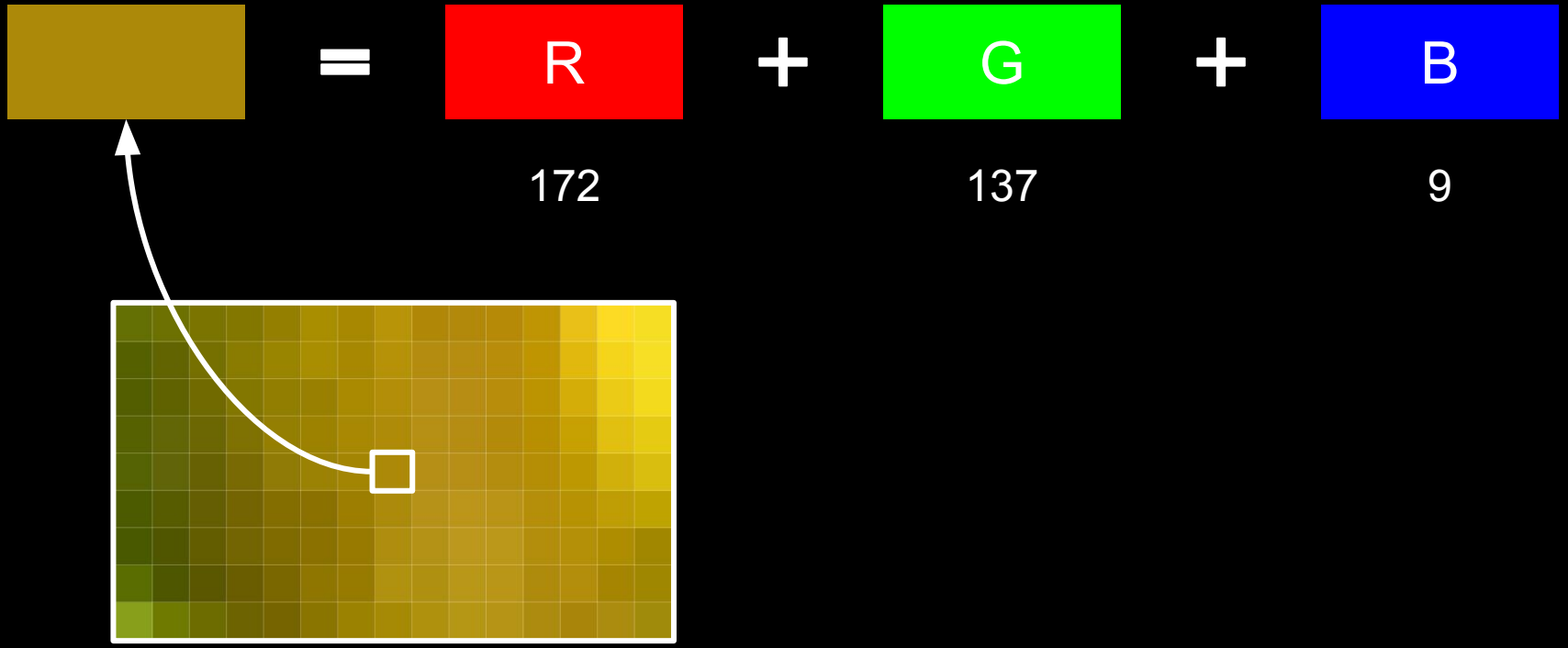


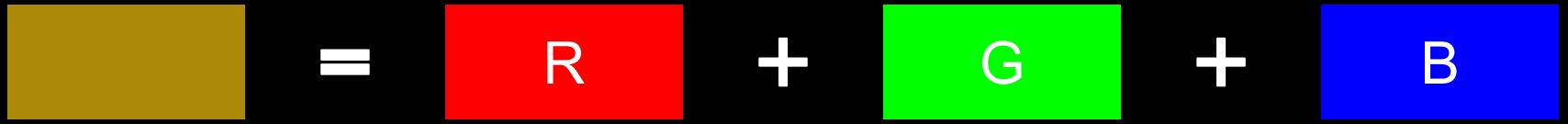




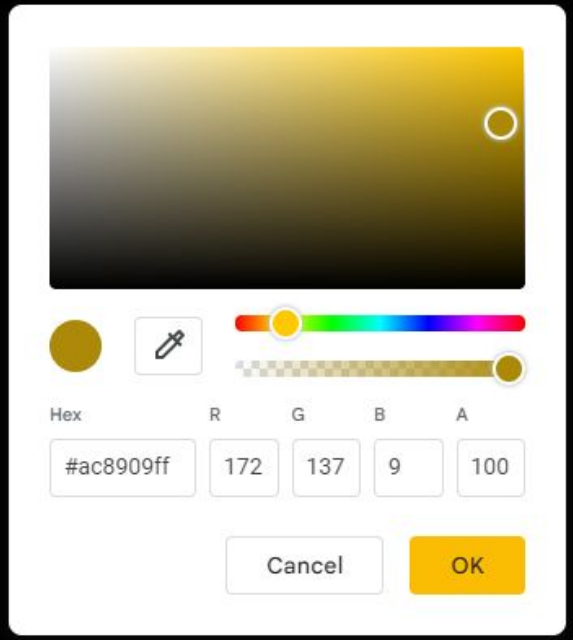



=
R
+
G
+
B


=
R
+
G
+
B
172
137
9



#AC8909


Hex
R
G
B
A
#ac8909ff
172
137
9
100
Cancel
OK

= R + G + B

	R	G	B
	172	137	9
#AC8909	AC	89	09

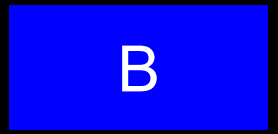
= R + G + B

	R	G	B
	172	137	9
#AC8909	AC	89	09
	10101100	01011001	00001001

possible colors?

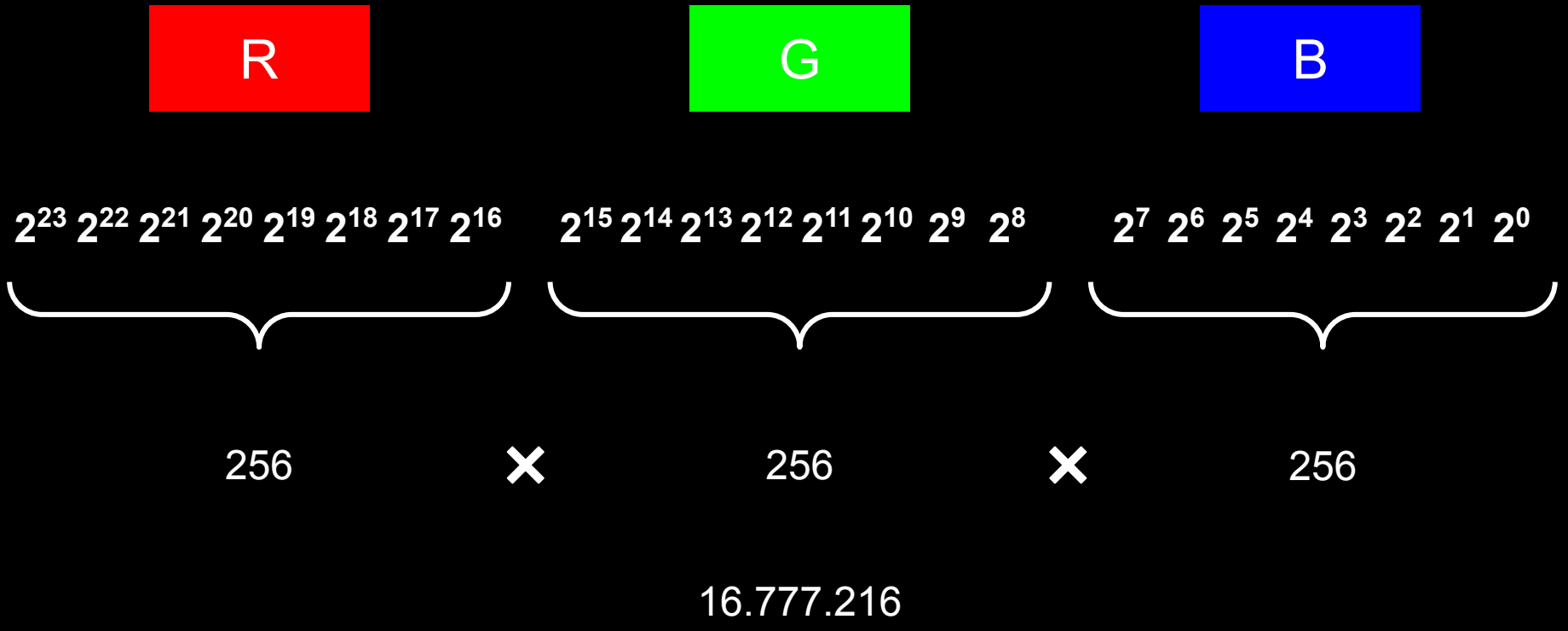
R

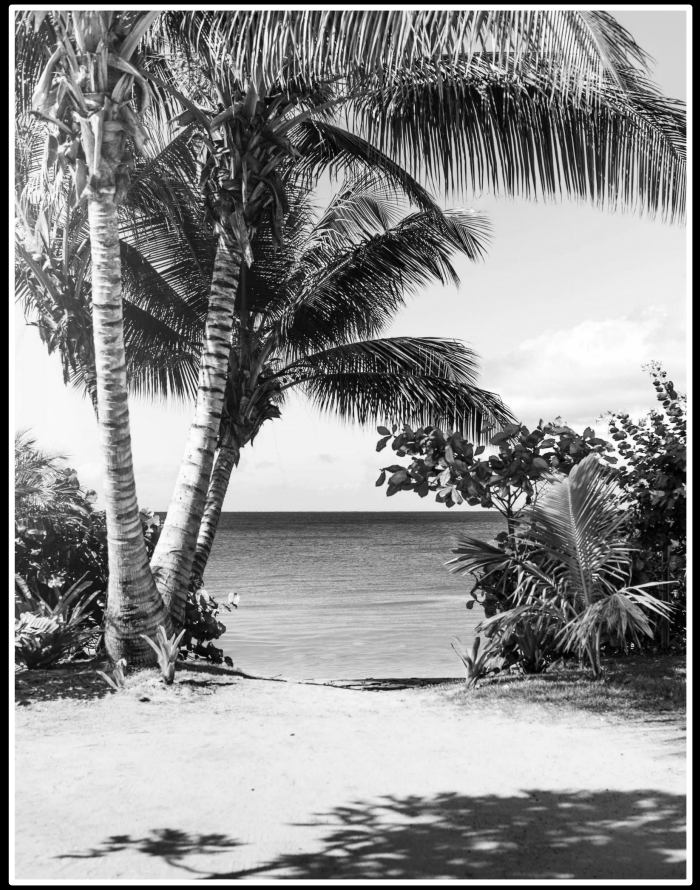
2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0



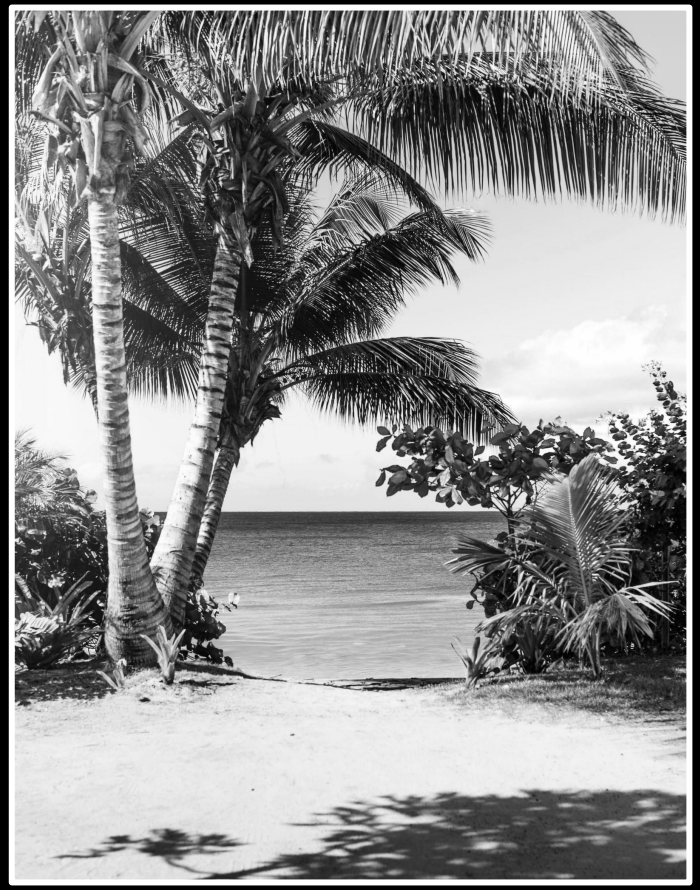
2^{23} 2^{22} 2^{21} 2^{20} 2^{19} 2^{18} 2^{17} 2^{16} 2^{15} 2^{14} 2^{13} 2^{12} 2^{11} 2^{10} 2^{9} 2^{8} 2^{7} 2^{6} 2^{5} 2^{4} 2^{3} 2^{2} 2^{1} 2^{0}

R
G
B
2^{23} 2^{22} 2^{21} 2^{20} 2^{19} 2^{18} 2^{17} 2^{16}
2^{15} 2^{14} 2^{13} 2^{12} 2^{11} 2^{10} 2^{9} 2^{8}
2^{7} 2^{6} 2^{5} 2^{4} 2^{3} 2^{2} 2^{1} 2^{0}
256
×
256
×
256


R
G
B
2^{23} 2^{22} 2^{21} 2^{20} 2^{19} 2^{18} 2^{17} 2^{16}
2^{15} 2^{14} 2^{13} 2^{12} 2^{11} 2^{10} 2^{9} 2^{8}
2^{7} 2^{6} 2^{5} 2^{4} 2^{3} 2^{2} 2^{1} 2^{0}
256
×
256
×
256
16.777.216

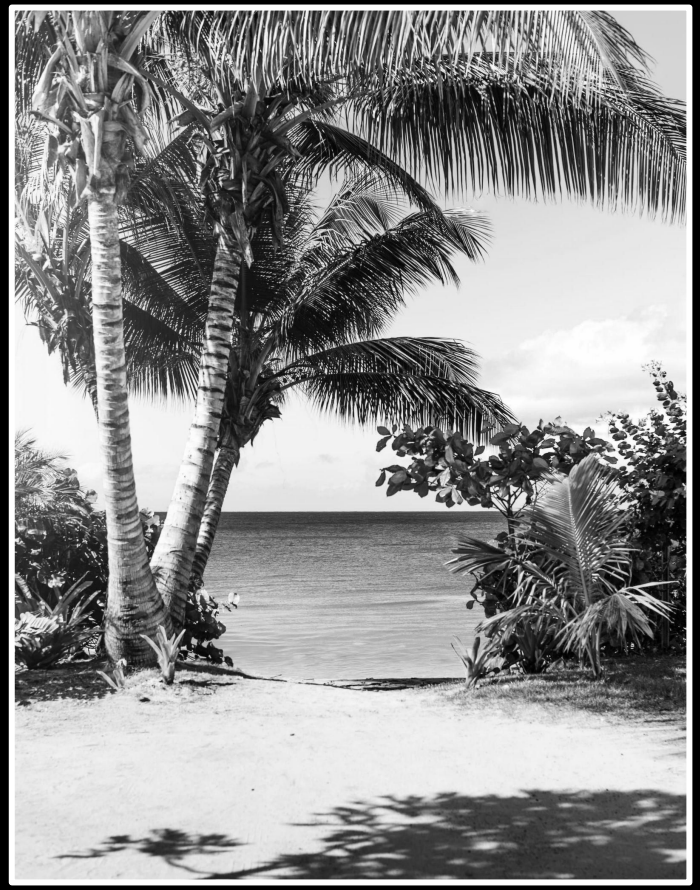


grayscale



grayscale

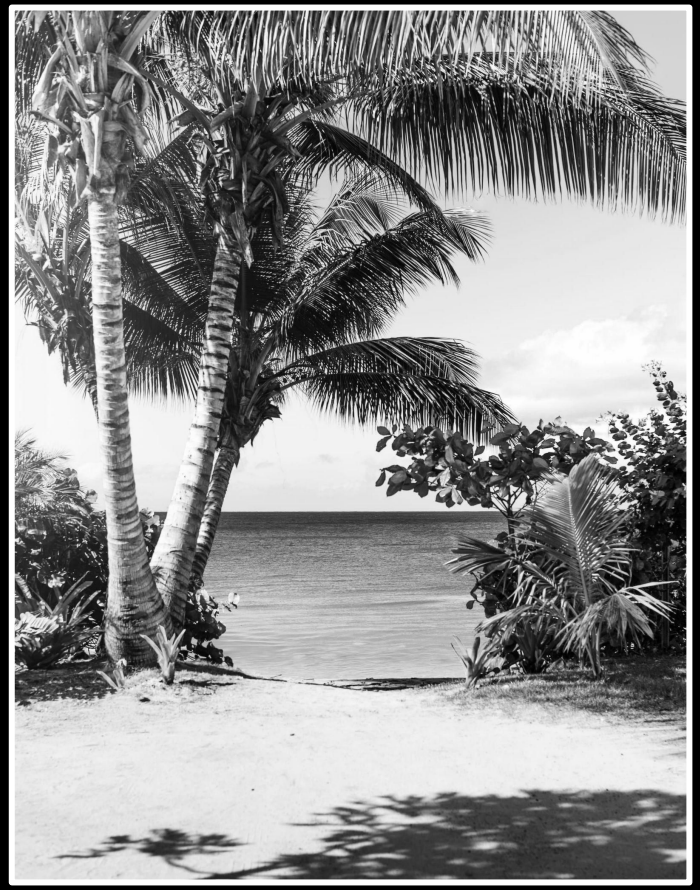
256 shades of gray



grayscale

256 shades of gray

how many bits ?



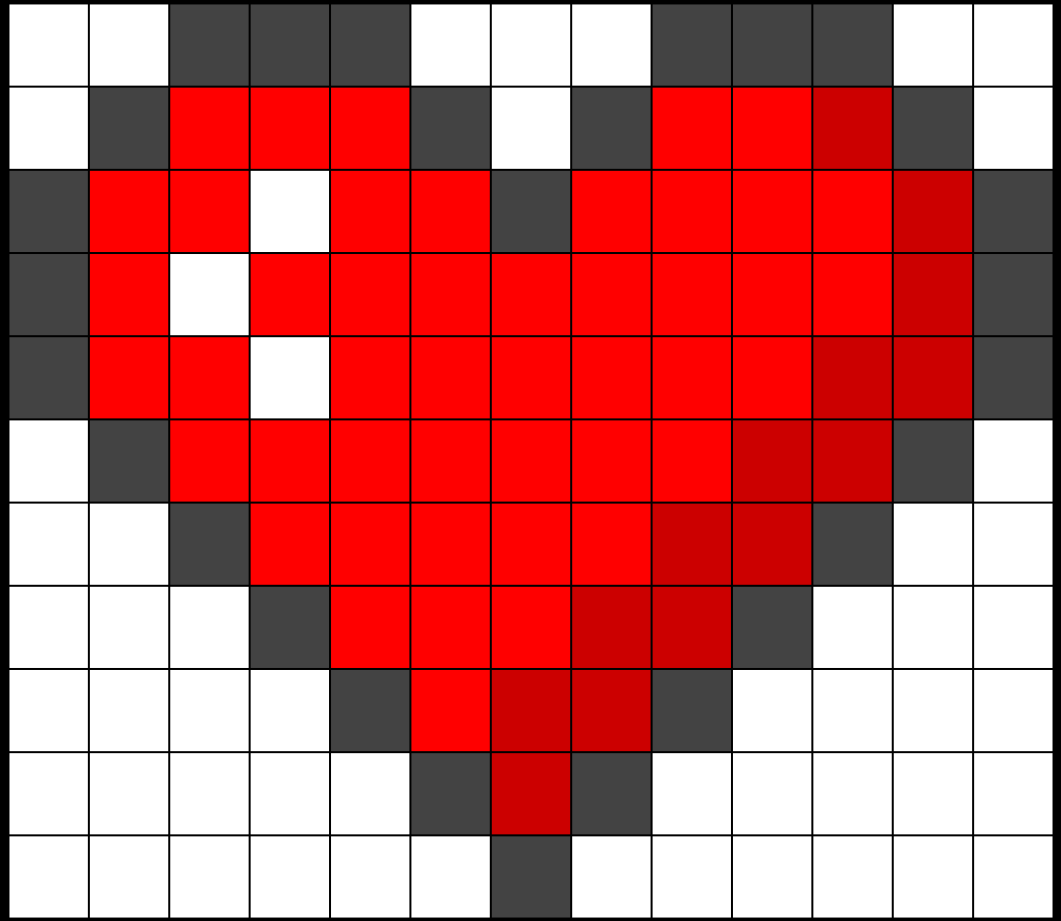
grayscale

256 shades of gray

how many bits ?

black/white

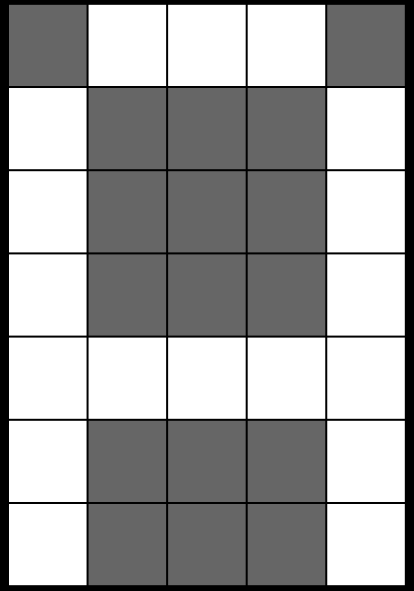
🤔

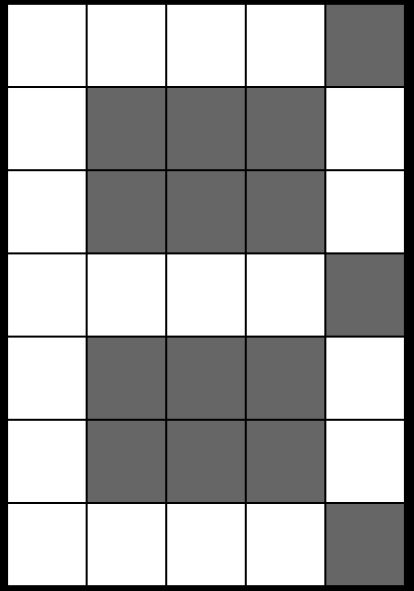


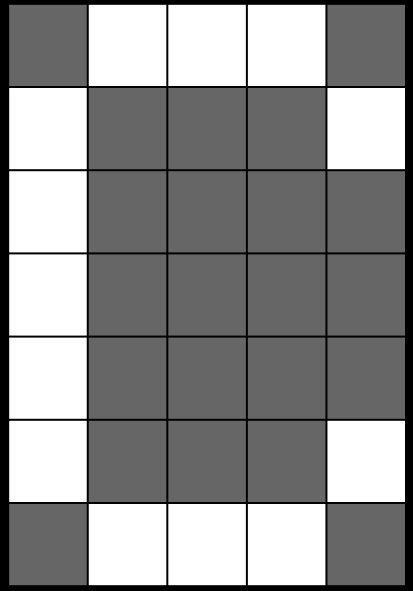
CS50 Pixel Art

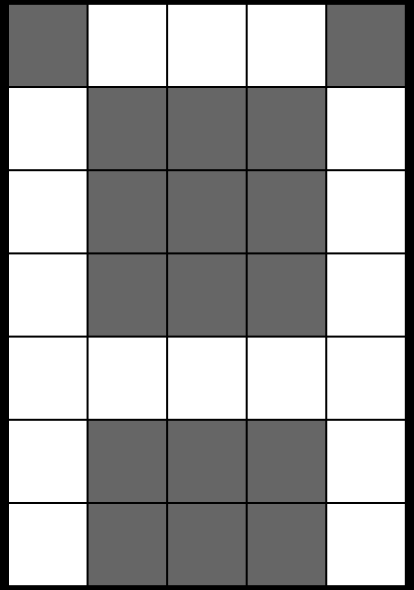
compression?

fonts

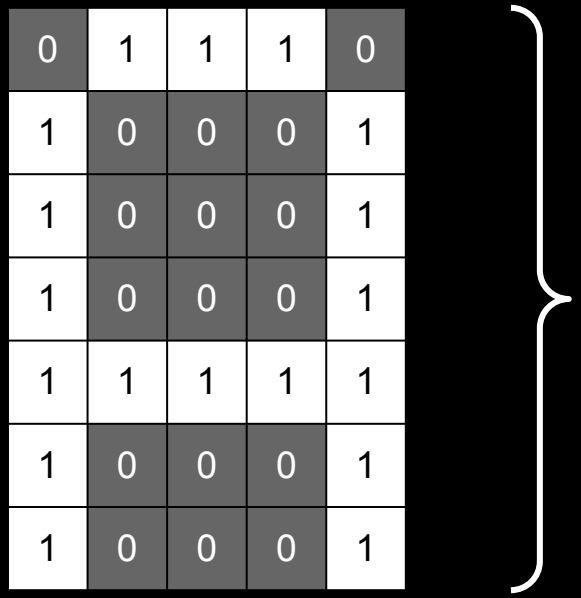








0	1	1	1	0
1	0	0	0	1
1	0	0	0	1
1	0	0	0	1
1	1	1	1	1
1	0	0	0	1
1	0	0	0	1



0 1 1 1 0 1 0 0 0 1 1 0 0 0 1 1 0 0
0 1 1 1 1 1 1 1 0 0 0 1 1 0 0 0 1

5

7

0	1	1	1	0
1	0	0	0	1
1	0	0	0	1
1	0	0	0	1
1	1	1	1	1
1	0	0	0	1
1	0	0	0	1

0 1 1 1 0 1 0 0 0 1 1 0 0 0 1 1 0 0
0 1 1 1 1 1 1 1 0 0 0 1 1 0 0 0 1

bitmap

vector graphics

```
<svg width="440" height="220" xmlns="http://www.w3.org/2000/svg">
  <circle cx="60" cy="60" r="50" stroke="#0085C7" stroke-width="10" fill="none" />
  <circle cx="180" cy="60" r="50" stroke="#000000" stroke-width="10" fill="none" />
  <circle cx="300" cy="60" r="50" stroke="#DF0024" stroke-width="10" fill="none" />
  <circle cx="120" cy="110" r="50" stroke="#FFD500" stroke-width="10" fill="none" />
  <circle cx="240" cy="110" r="50" stroke="#009F3D" stroke-width="10" fill="none" />
</svg>
```

```
<svg width="440" height="220" xmlns="http://www.w3.org/2000/svg">
  <circle cx="60" cy="60" r="50" stroke="#0085C7" stroke-width="10" fill="none" />
  <circle cx="180" cy="60" r="50" stroke="#000000" stroke-width="10" fill="none" />
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</svg>
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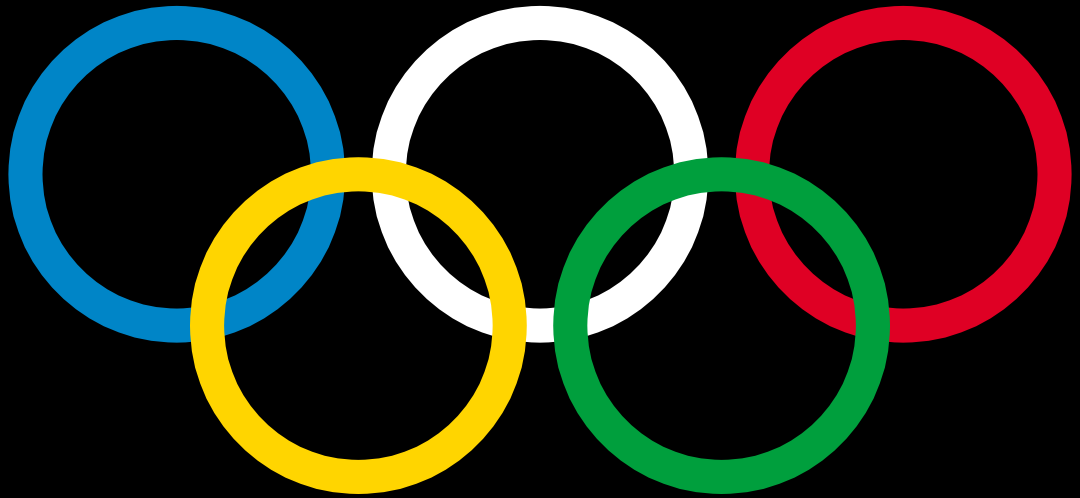
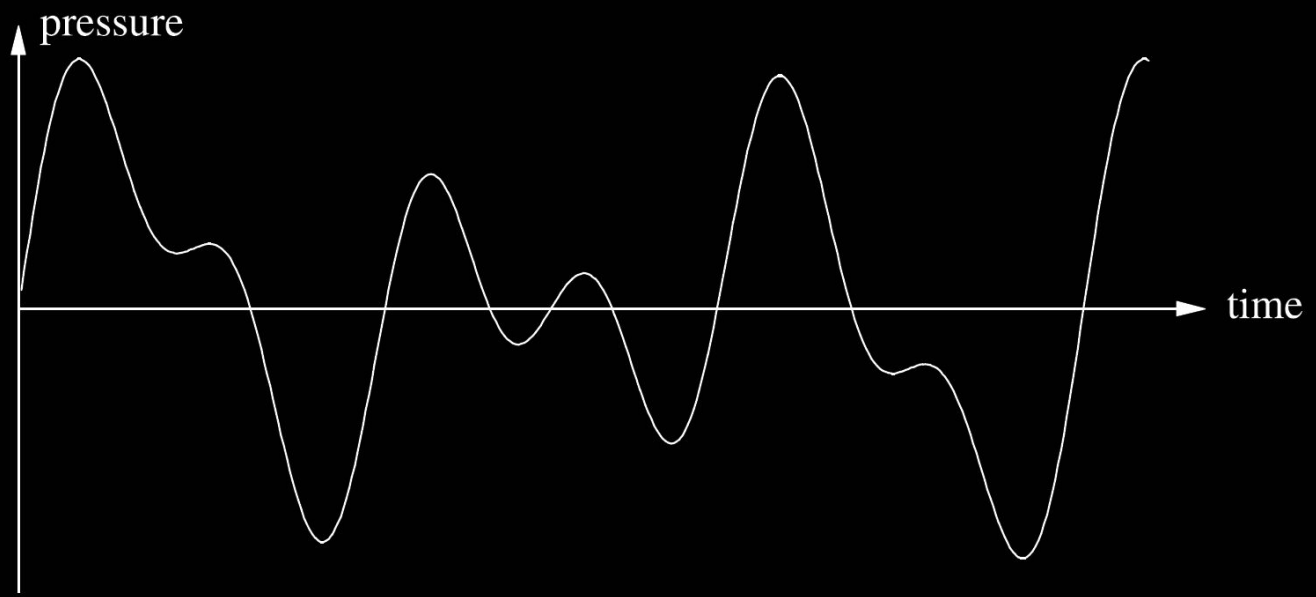
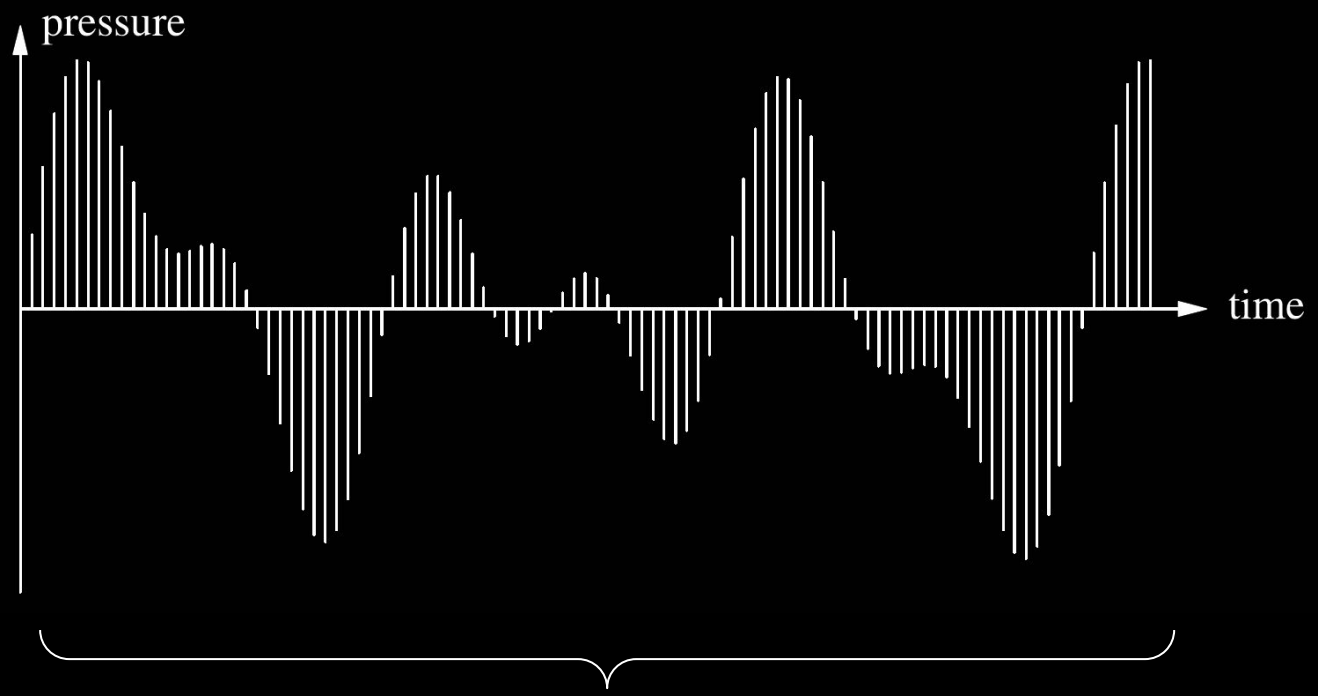
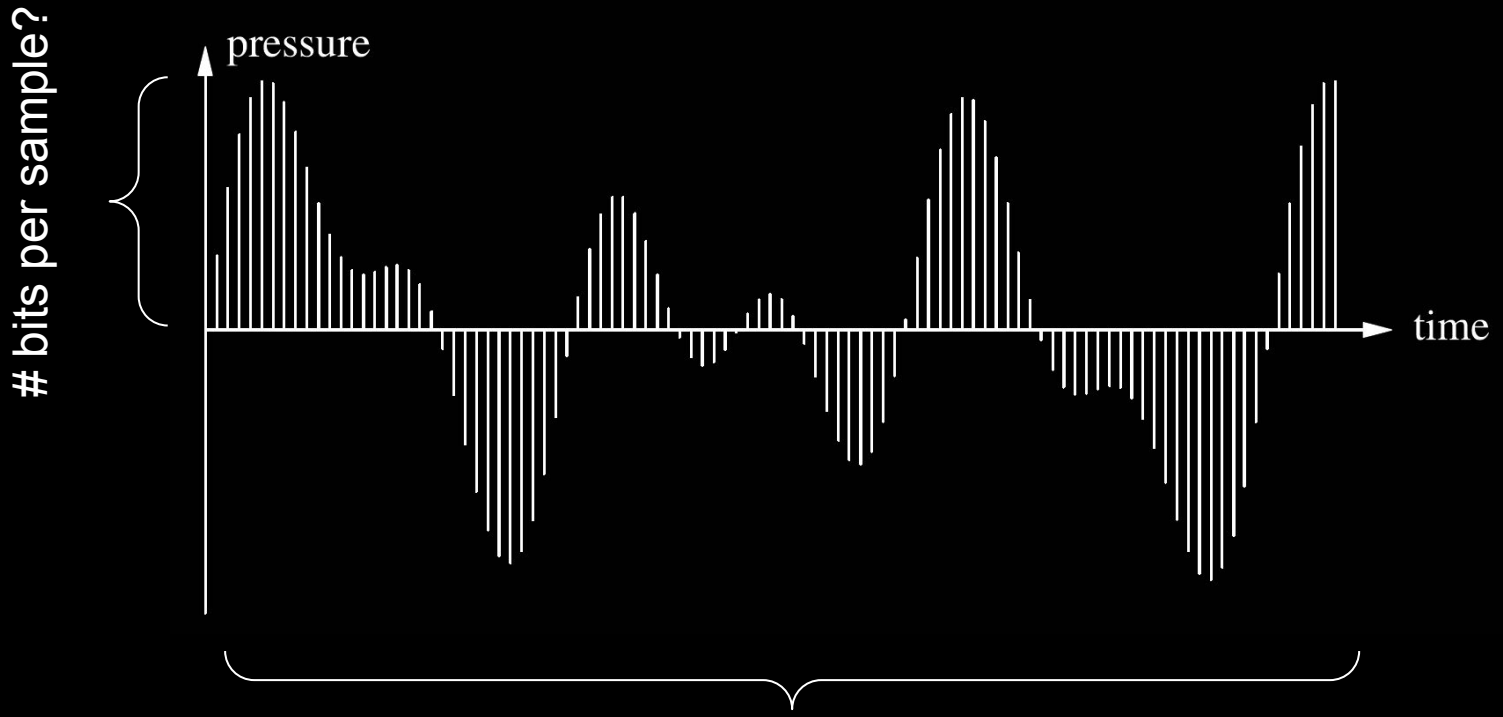


representing sound

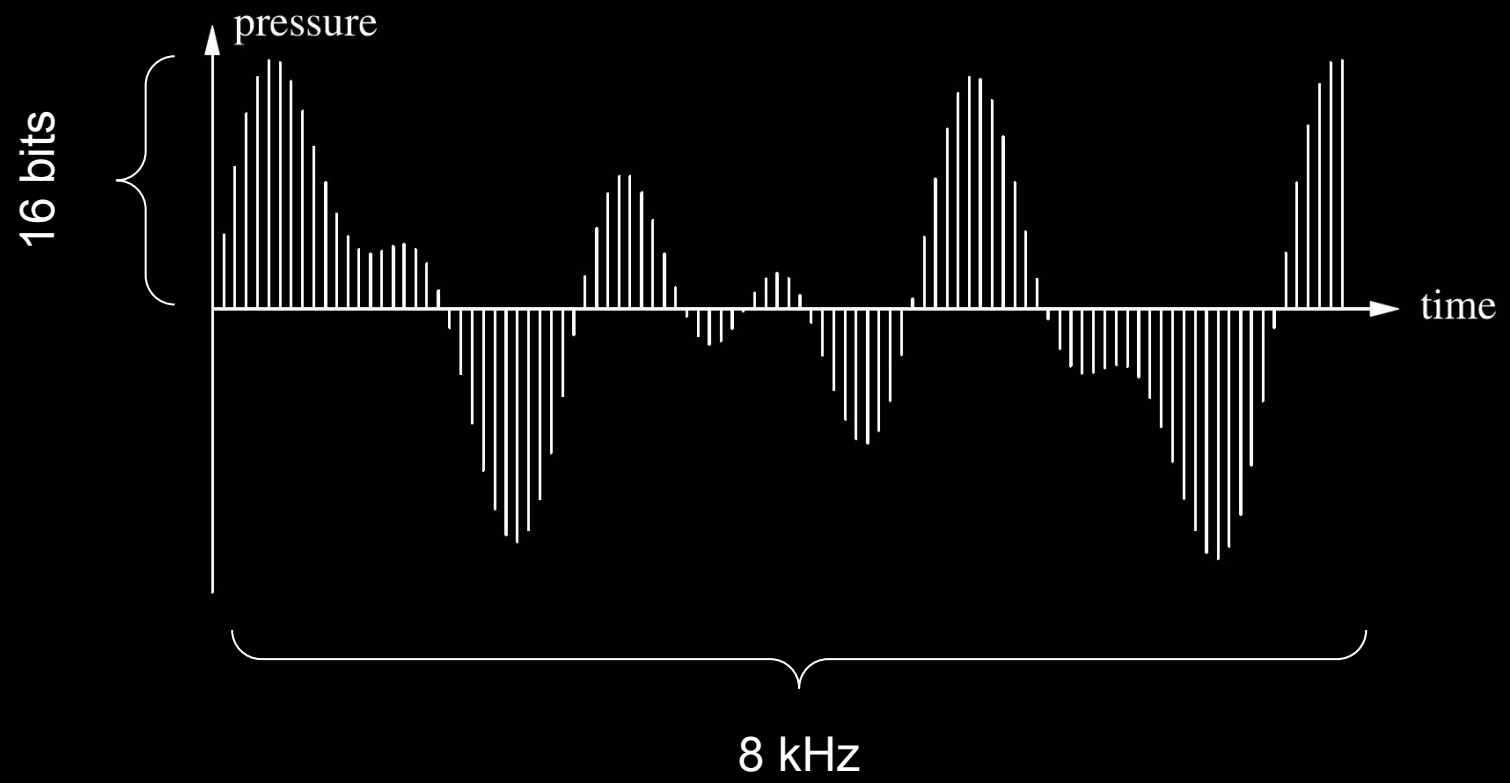

pressure
time



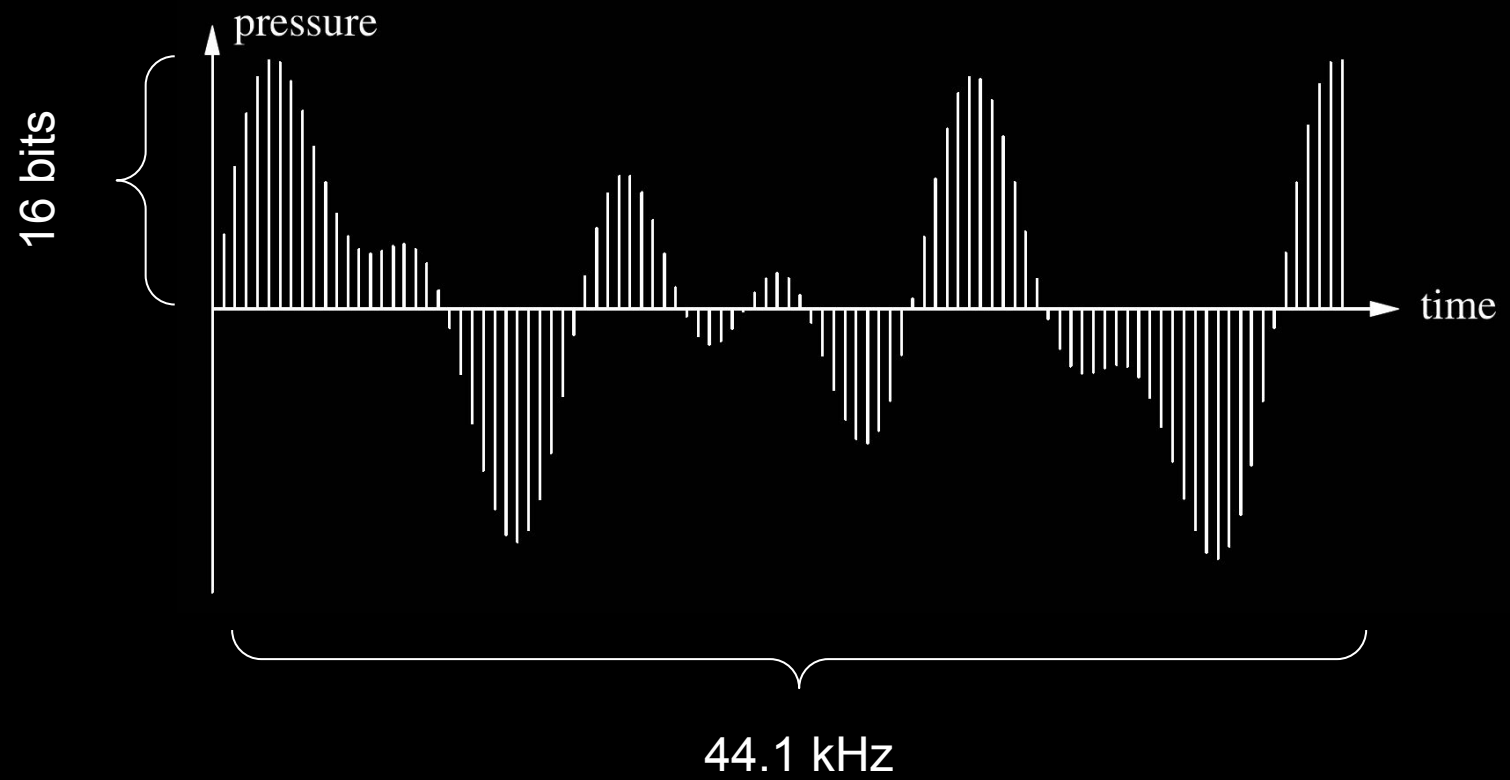
how many samples per time unit?


bits per sample?
pressure
time
samples per time unit?

telephone

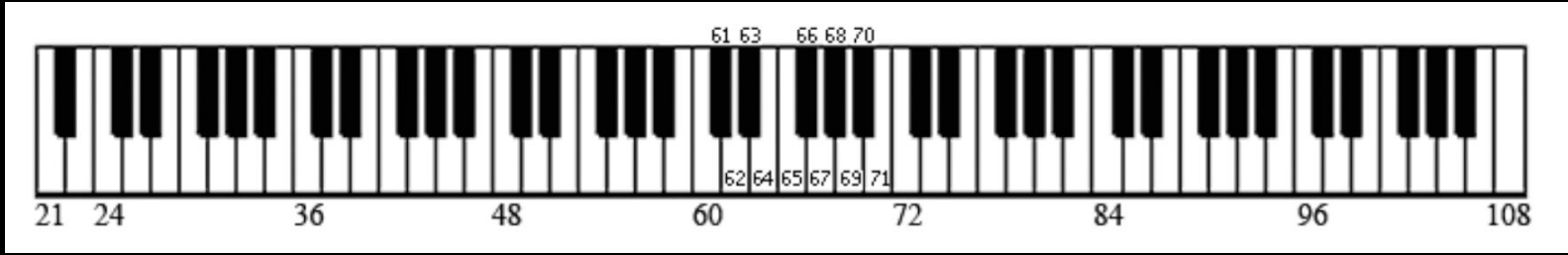

pressure
16 bits
time
8 kHz

music


pressure
16 bits
time
44.1 kHz

musical instrument digital interface (MIDI)

byte 1 = note
byte 2 = velocity



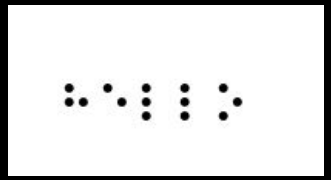
what code systems exist outside of computers?

a)

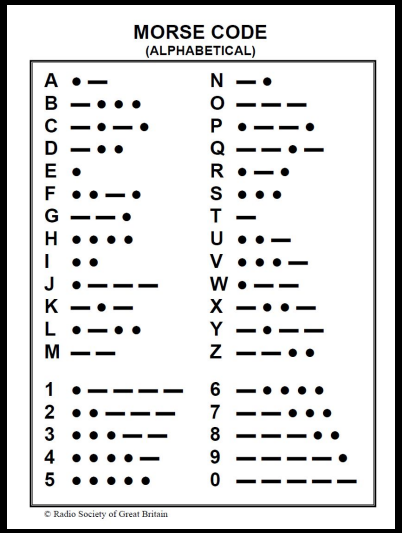
4 054477 008270

b)

c)



d)


MORSE CODE
(ALPHABETICAL)
A •—
B —•••
C —•—•
D —••
E •
F ••—•
G ——•
H ••••
I ••
J •———
K —•—
L •—••
M ——
N —•
O ———
P •——•
Q ——•—
R •—•
S •••
T —
U ••—
V •••—
W •——
X —••—
Y —•——
Z ——••
1 •————
2 ••———
3 •••——
4 ••••—
5 •••••
6 —••••
7 ——•••
8 ———••
9 ————•
0 —————
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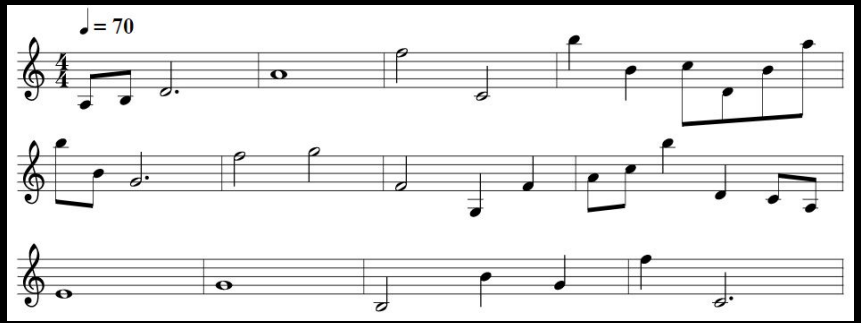
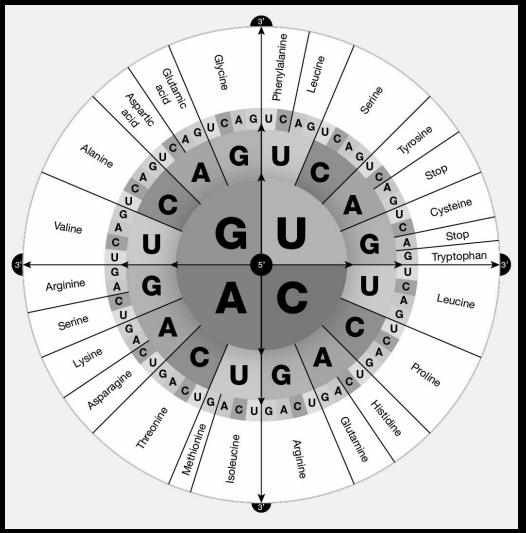
e)


♩= 70

f)


Glycine
Phenylalanine
Leucine
Serine
Tyrosine
Stop
Cysteine
Stop
Tryptophan
Leucine
Proline
Histidine
Glutamine
Arginine
Isoleucine
Methionine
Threonine
Asparagine
Lysine
Serine
Arginine
Valine
Alanine
Aspartic acid
Glutamic acid
5'
3'