

CODE SYSTEMS

[BACK](#)

problem-solving

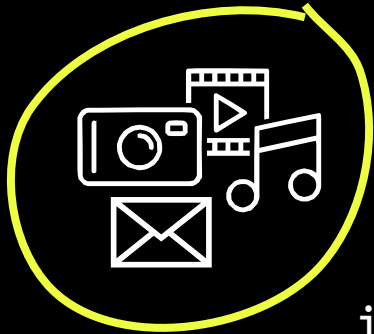
algorithms

communication

information
representation

information
processing

information
sharing



input



program



output





MORSE CODE

(ALPHABETICAL)

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	— — • •
1	• — — — —	6	— • • • •
2	• • — — —	7	— — • • •
3	• • • — —	8	— — — • •
4	• • • • —	9	— — — — •
5	• • • • •	0	— — — — —

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



1F600



1F601



1F602



1F603

...



1F648



1F649



1F64A



1F64B

Unicode



1F600



1F601



1F602



1F603

...



1F648



1F649



1F64A



1F64B

hexadecimal

1

A

D

(hexadecimal)

16^2

16^1

16^0

1

A

D

(hexadecimal)

16^2

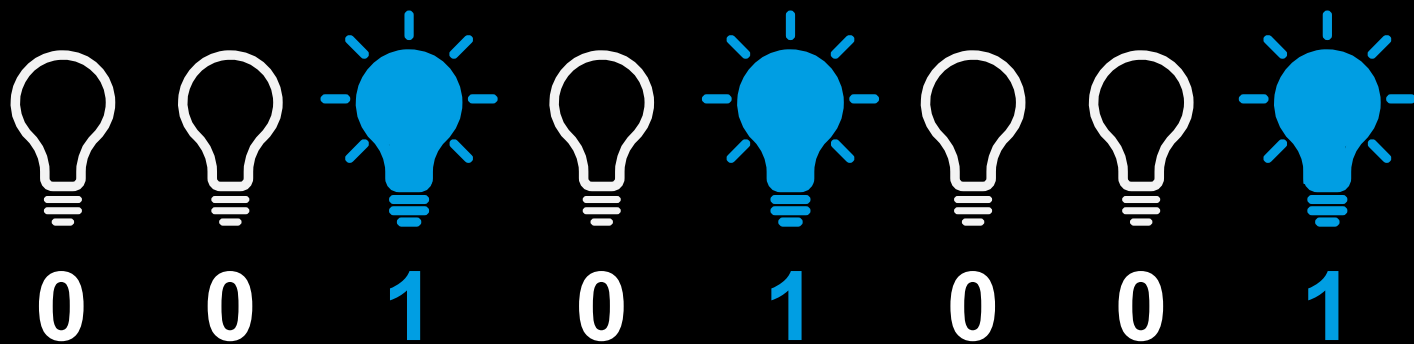
16^1

16^0

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

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

$$= 429 \text{ (decimal)}$$



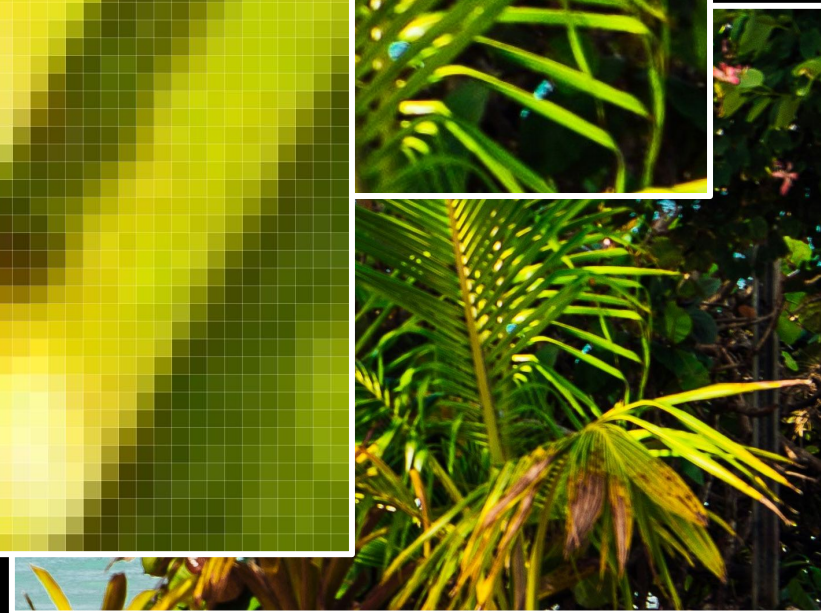
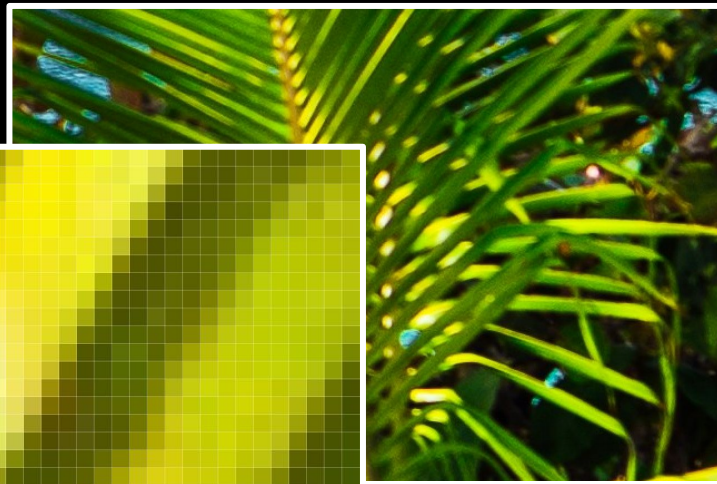
2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
128	64	32	16	8	4	2	1

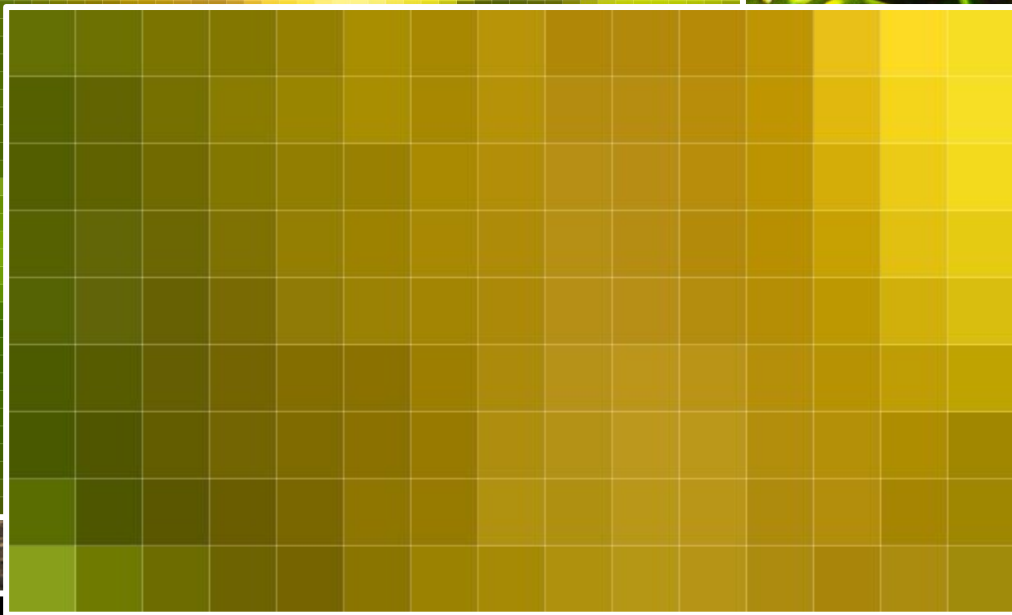
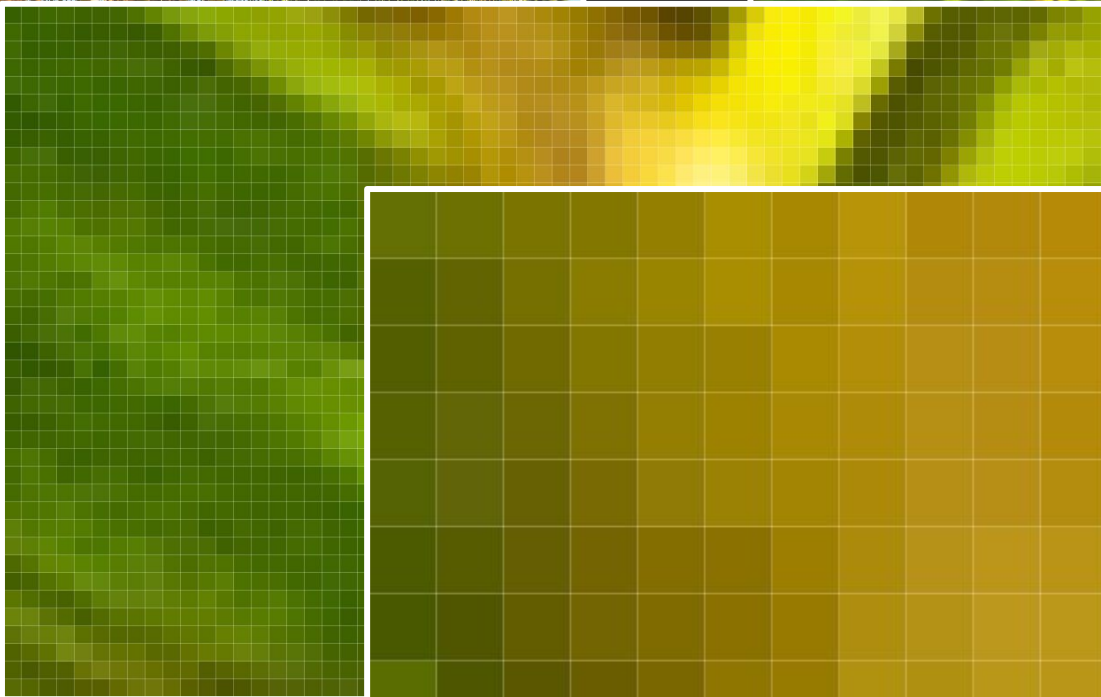
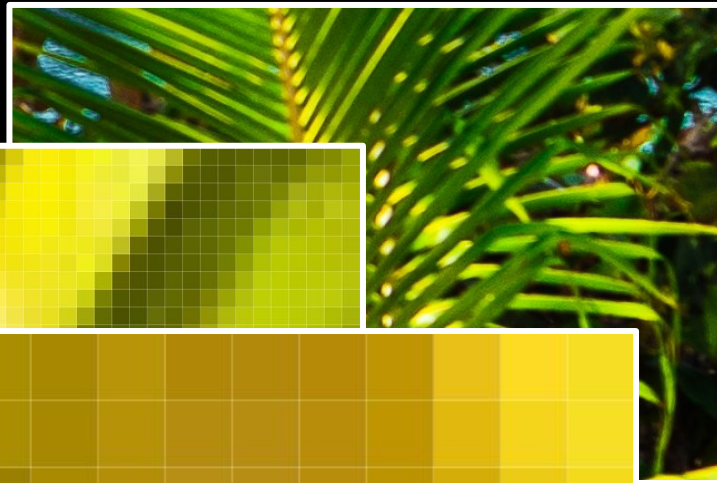
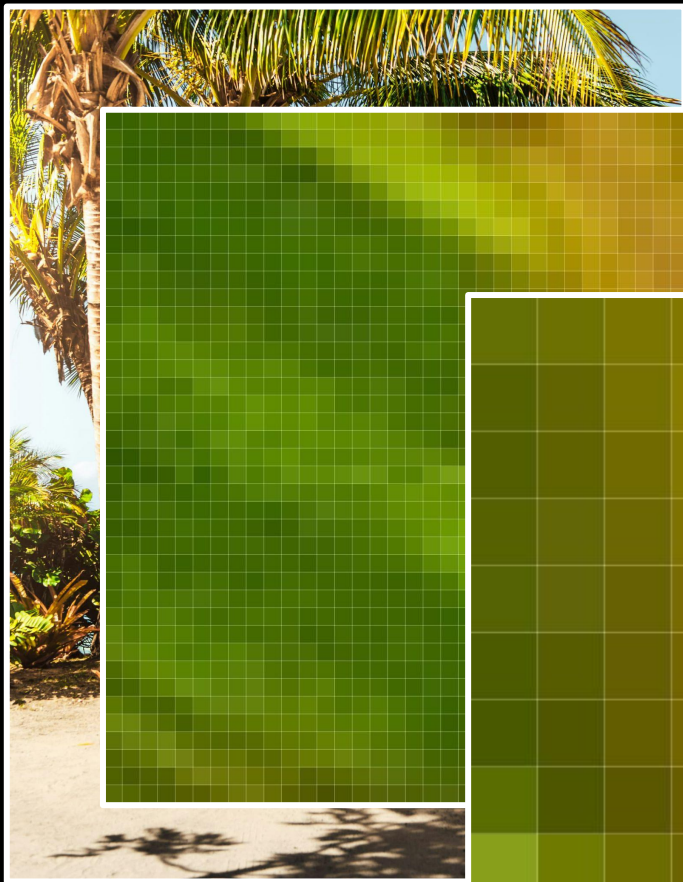
representing images

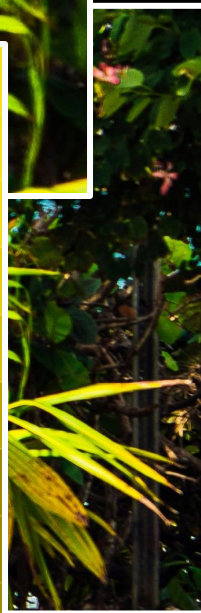
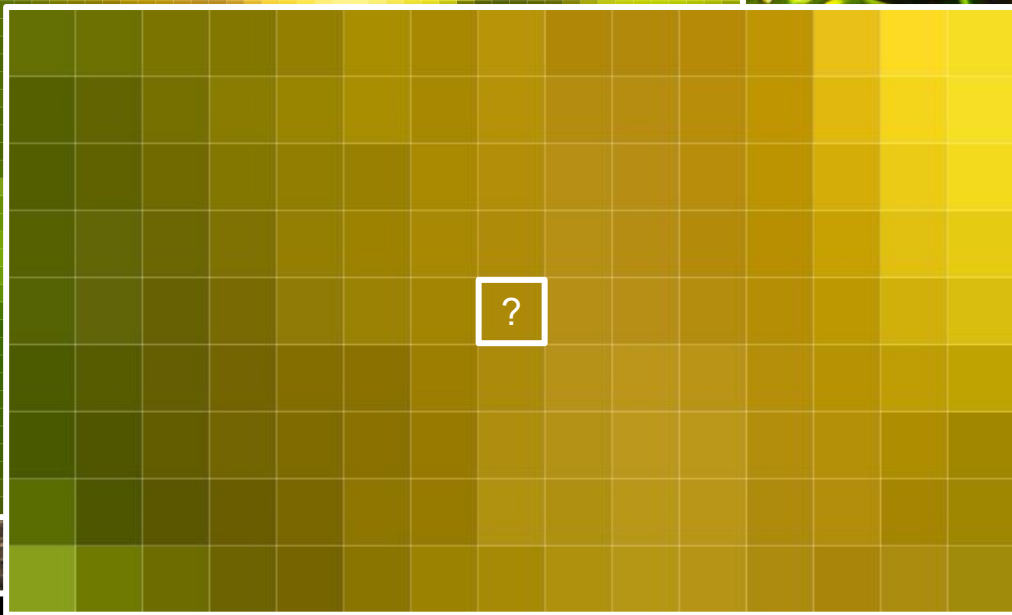
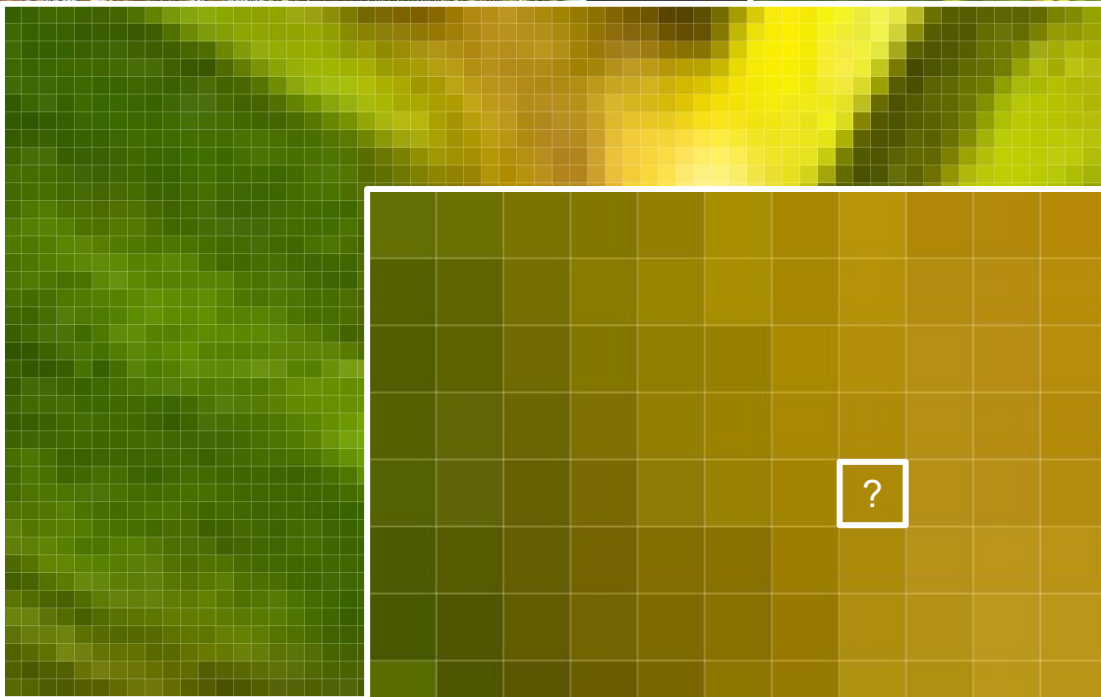




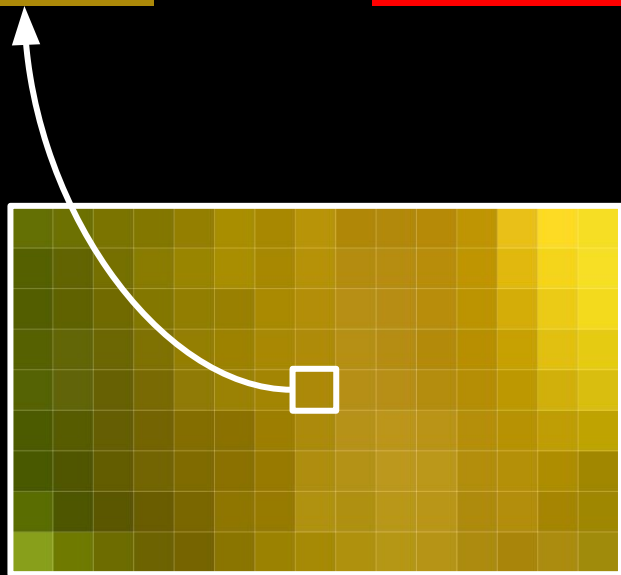





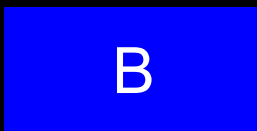




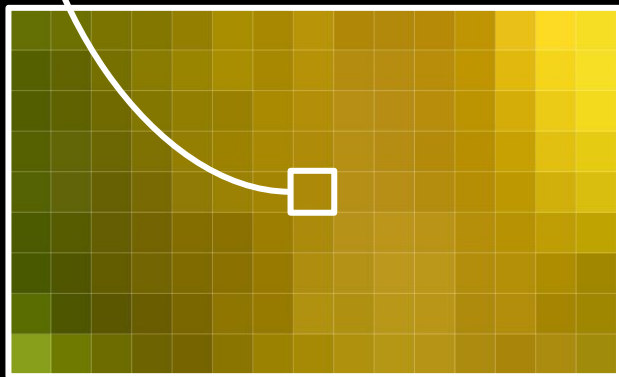


$$\text{[Solid Yellow Box]} = \text{[Red Box with 'R']} + \text{[Green Box with 'G']} + \text{[Blue Box with 'B']}$$



 =  +  + 

172 137 9





=



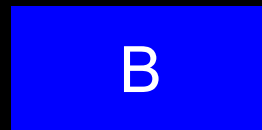
R

+



G

+

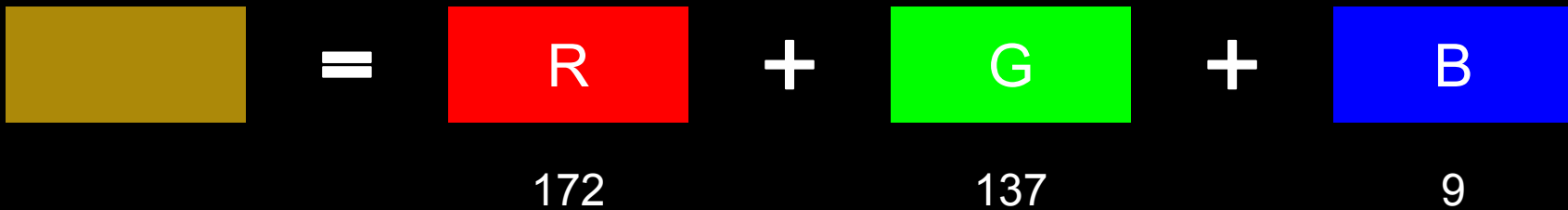


B

172

137

9



#AC8909



Hex

R

G

B

A

#ac8909ff

172

137

9

100

Cancel

OK



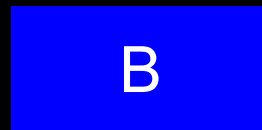
=



+



+



172

137

9

#AC8909

AC

89

09



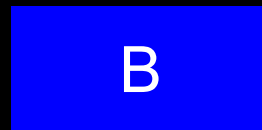
=



+



+



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



A red rectangular block representing the Red color channel. Below it, a series of 8 power-of-two terms are listed, representing the bit weights for this channel.

R

2^{23} 2^{22} 2^{21} 2^{20} 2^{19} 2^{18} 2^{17} 2^{16}



A green rectangular block representing the Green color channel. Below it, a series of 8 power-of-two terms are listed, representing the bit weights for this channel.

G

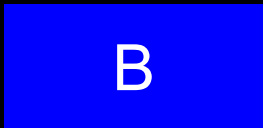
2^{15} 2^{14} 2^{13} 2^{12} 2^{11} 2^{10} 2^9 2^8



A blue rectangular block representing the Blue color channel. Below it, a series of 8 power-of-two terms are listed, representing the bit weights for this channel.

B

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



$2^{23} 2^{22} 2^{21} 2^{20} 2^{19} 2^{18} 2^{17} 2^{16}$

$2^{15} 2^{14} 2^{13} 2^{12} 2^{11} 2^{10} 2^9 2^8$

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



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

bitmap file header

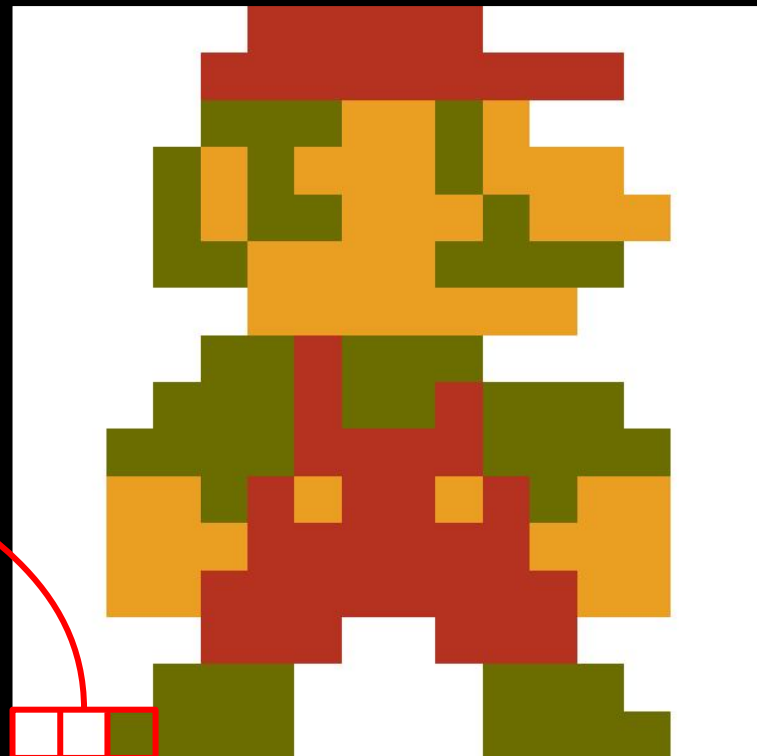
bitmap info header

pixel data

super_mario_color.bmp x															
00000000	42	4D	36	03	00	00	00	00	00	00	00	36	00	00	28 00
00000010	00	00	10	00	00	00	10	00	00	00	01	00	18	00	00 00
00000020	00	00	00	03	00	00	C4	0E	00	00	C4	0E	00	00	00 00
00000030	00	00	00	00	00	00	FF	FF	FF	FF	FF	FF	00	6D	6B 00
00000040	6D	6B	00	6D	6B	00	6D	6B	FF	FF	FF	FF	FF	FF	FF
00000050	FF	FF	FF	FF	00	6D	6B	00	6D	6B	00	6D	6B	00	6D 6B
00000060	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	00
00000070	6D	6B	00	6D	6B	00	6D	6B	FF	FF	FF	FF	FF	FF	FF
00000080	FF	FF	FF	FF	00	6D	6B	00	6D	6B	00	6D	6B	FF	FF
00000090	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
000000A0	FF	FF	20	31	B5	20	31	B5	20	31	B5	FF	FF	FF	FF
000000B0	FF	20	31	B5	20	31	B5	20	31	B5	FF	FF	FF	FF	FF
000000C0	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	22	9E	EA 22
000000D0	9E	EA	20	31	B5	20	31	B5	20	31	B5	20	31	B5	20 31
000000E0	B5	20	31	B5	20	31	B5	20	31	B5	22	9E	EA	22	9E EA
000000F0	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	22	9E	EA 22
00000100	9E	EA	22	9E	EA	20	31	B5	20	31	B5	20	31	B5	20 31
00000110	B5	20	31	B5	20	31	B5	22	9E	EA	22	9E	EA	22	9E EA
00000120	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	22	9E	EA 22

super_mario_color.bmp x

00000000	42 4D 36 03 00 00 00 00	00 00 36 00 00 00 28 00
00000010	00 00 10 00 00 00 10 00	00 00 01 00 18 00 00 00
00000020	00 00 00 03 00 00 C4 0E	00 00 C4 0E 00 00 00 00
00000030	00 00 00 00 00 00 FF FF	FF FF FF 00 6D 6B 00
00000040	6D 6B 00 6D 6B 00 6D 6B	FF FF FF FF FF FF FF FF
00000050	FF FF FF FF 00 6D 6B 00	6D 6B 00 6D 6B 00 6D 6B
00000060	FF FF FF FF FF FF FF FF	FF FF FF FF FF FF FF 00
00000070	6D 6B 00 6D 6B 00 6D 6B	FF FF FF FF FF FF FF FF
00000080	FF FF FF FF 00 6D 6B 00	6D 6B 00 6D 6B FF FF FF
00000090	FF FF FF FF FF FF FF FF	FF FF FF FF FF FF FF FF
000000A0	FF FF 20 31 B5 20 31 B5	20 31 B5 FF FF FF FF FF
000000B0	FF 20 31 B5 20 31 B5 20	31 B5 FF FF FF FF FF FF
000000C0	FF FF FF FF FF FF FF FF	FF FF FF FF 22 9E EA 22
000000D0	9E EA 20 31 B5 20 31 B5	20 31 B5 20 31 B5 20 31
000000E0	B5 20 31 B5 20 31 B5 20	31 B5 22 9E EA 22 9E EA
000000F0	FF FF FF FF FF FF FF FF	FF FF FF FF 22 9E EA 22
00000100	9E EA 22 9E EA 20 31 B5	20 31 B5 20 31 B5 20 31
00000110	B5 20 31 B5 20 31 B5 22	9E EA 22 9E EA 22 9E EA
00000120	FF FF FF FF FF FF FF FF	FF FF FF FF 22 9E EA 22





grayscale



grayscale

256 shades of gray



grayscale

256 shades of gray

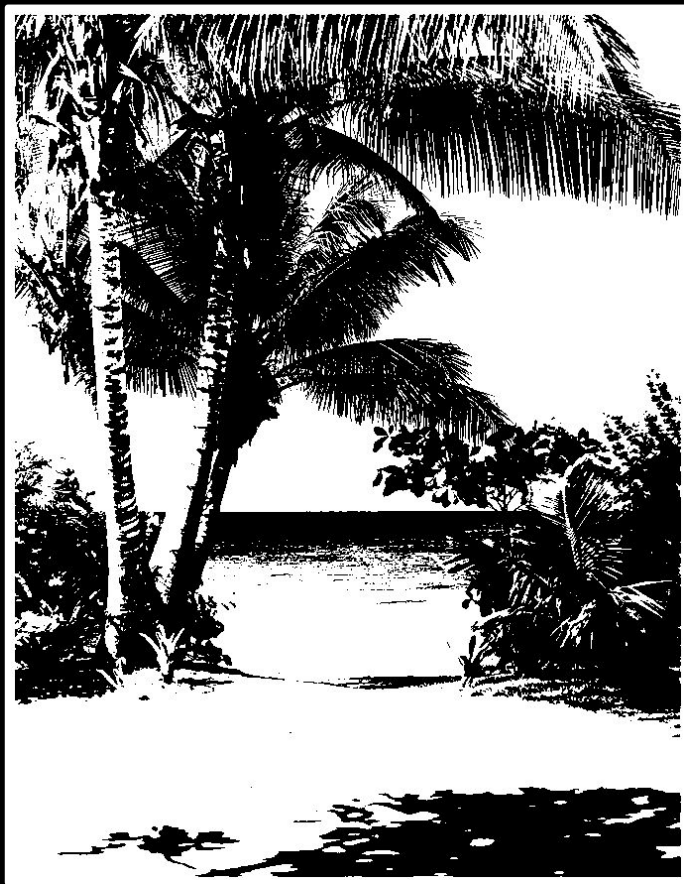
how many bits ?



grayscale

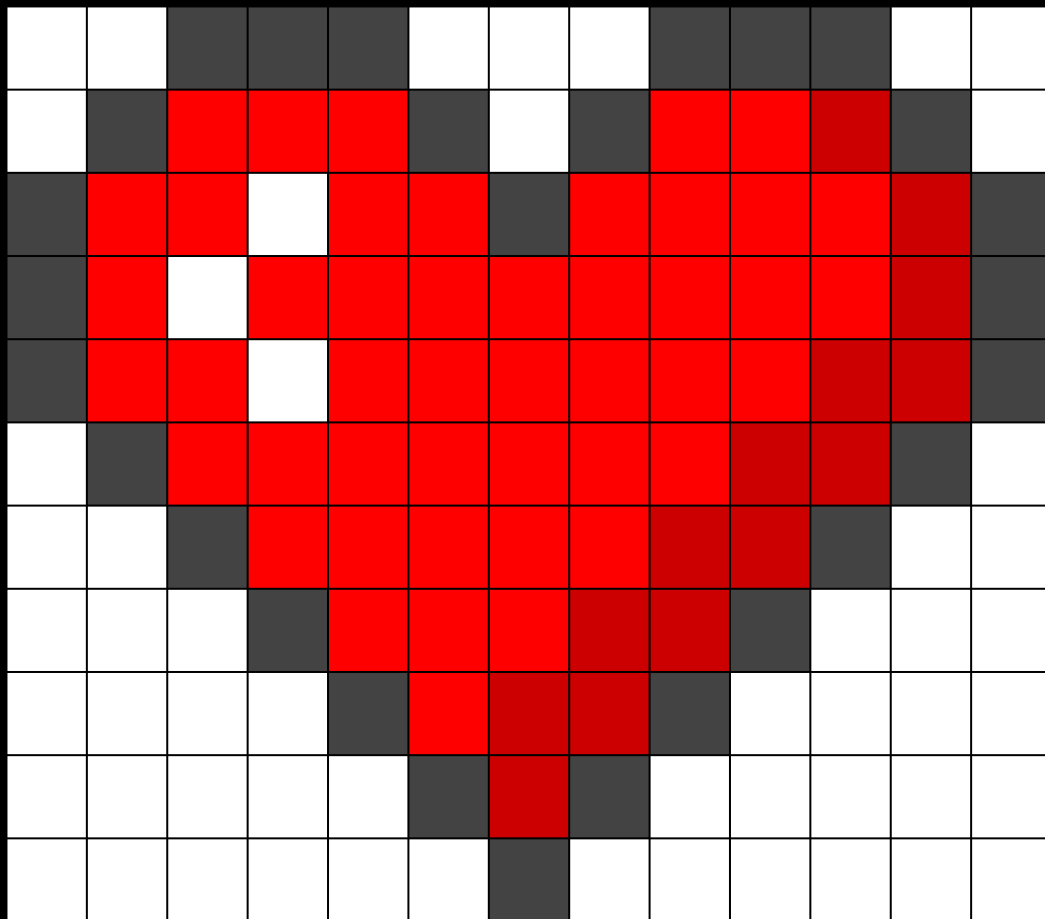
256 shades of gray

how many bits ?



black/white

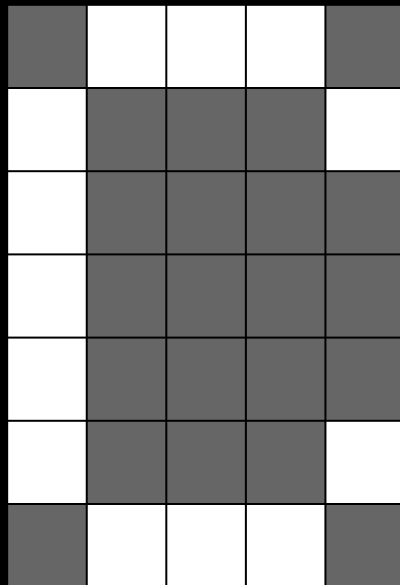
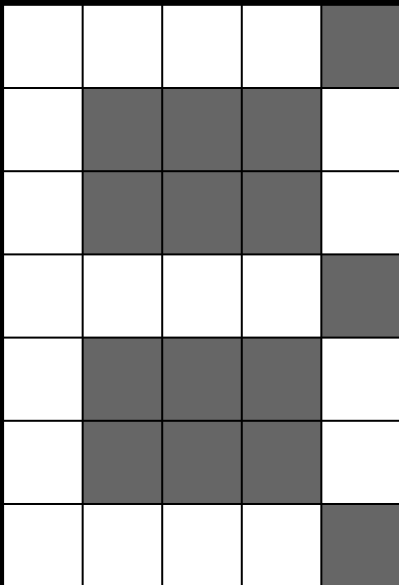
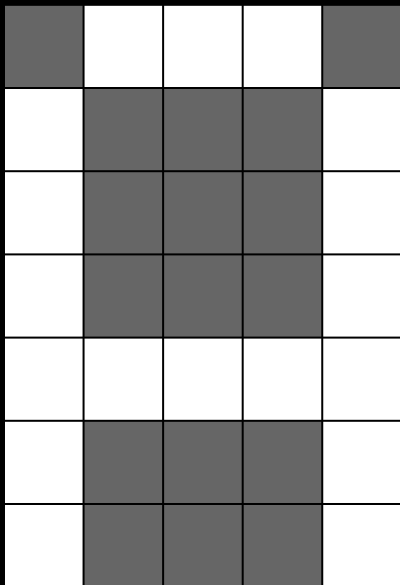


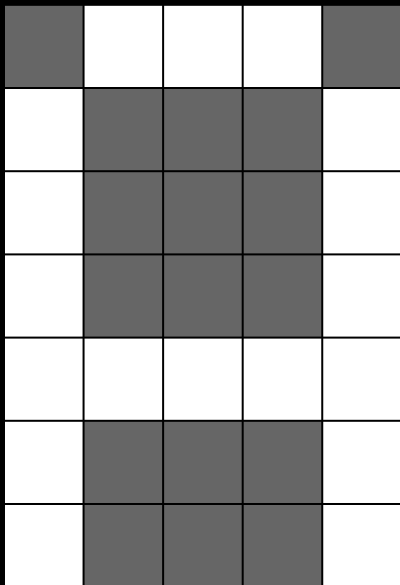




compression?

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



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



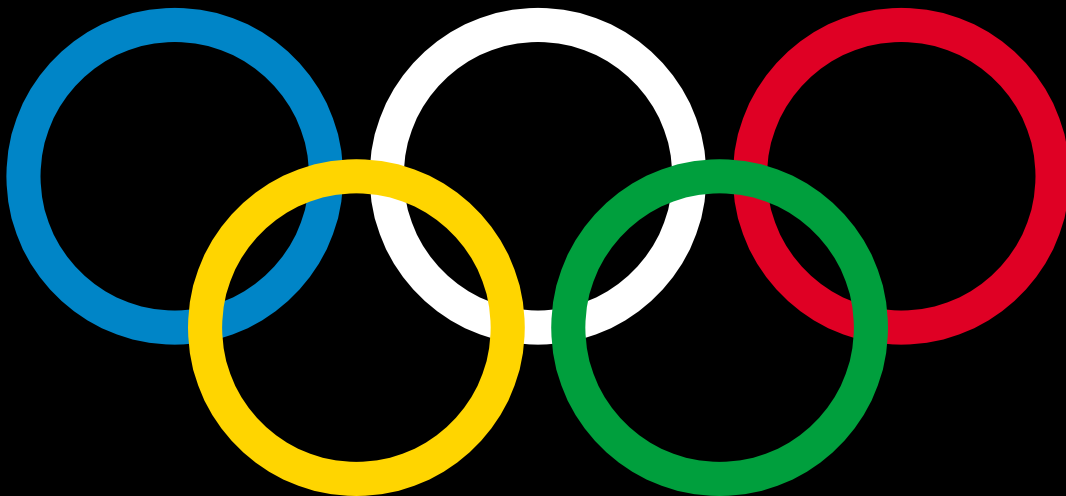
0 1 1 1 0 1 0 0 0 1 1 0 0 0 1 1 0 0
 0 1 1 1 1 1 1 1 0 0 0 1 1 0 0 0 1

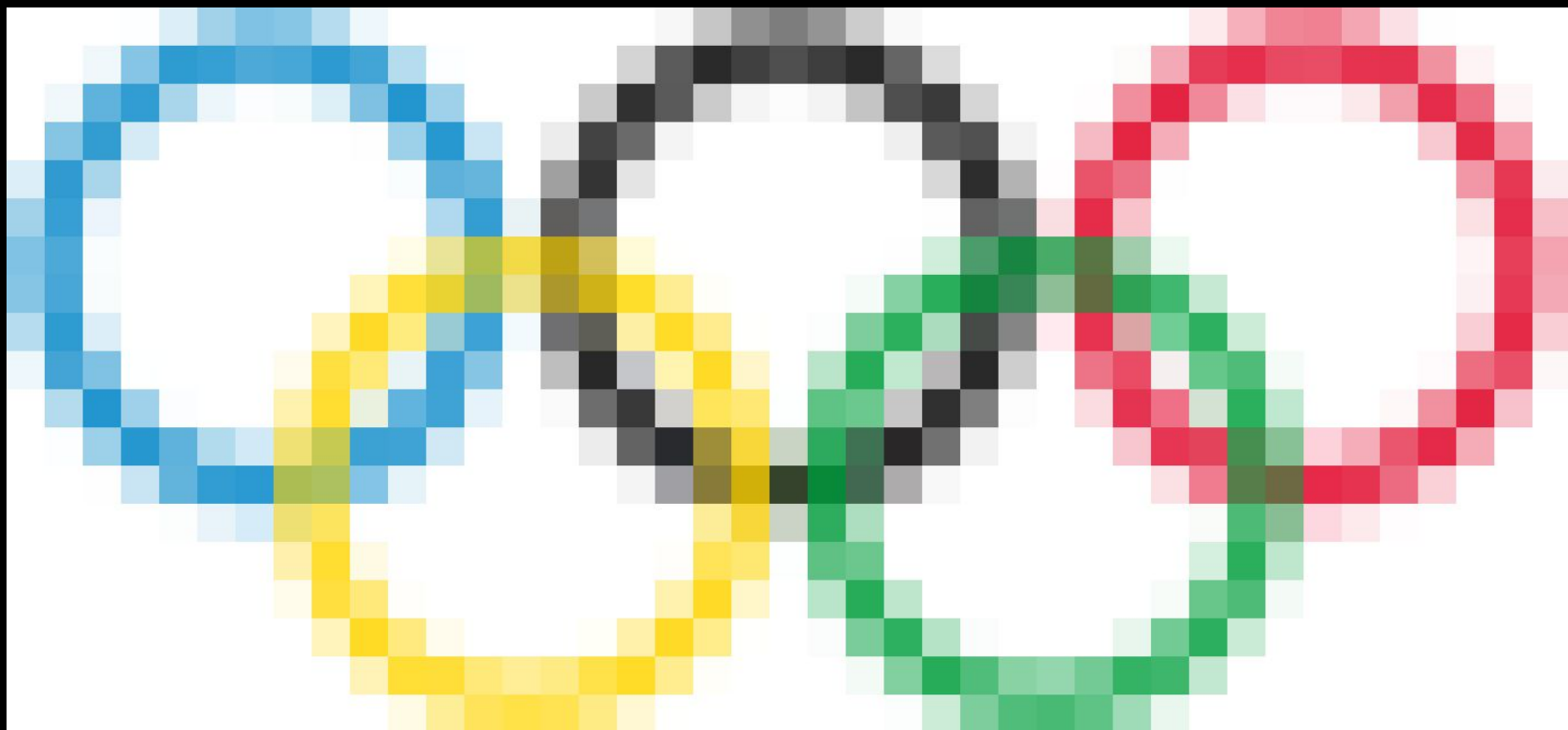
bitmap

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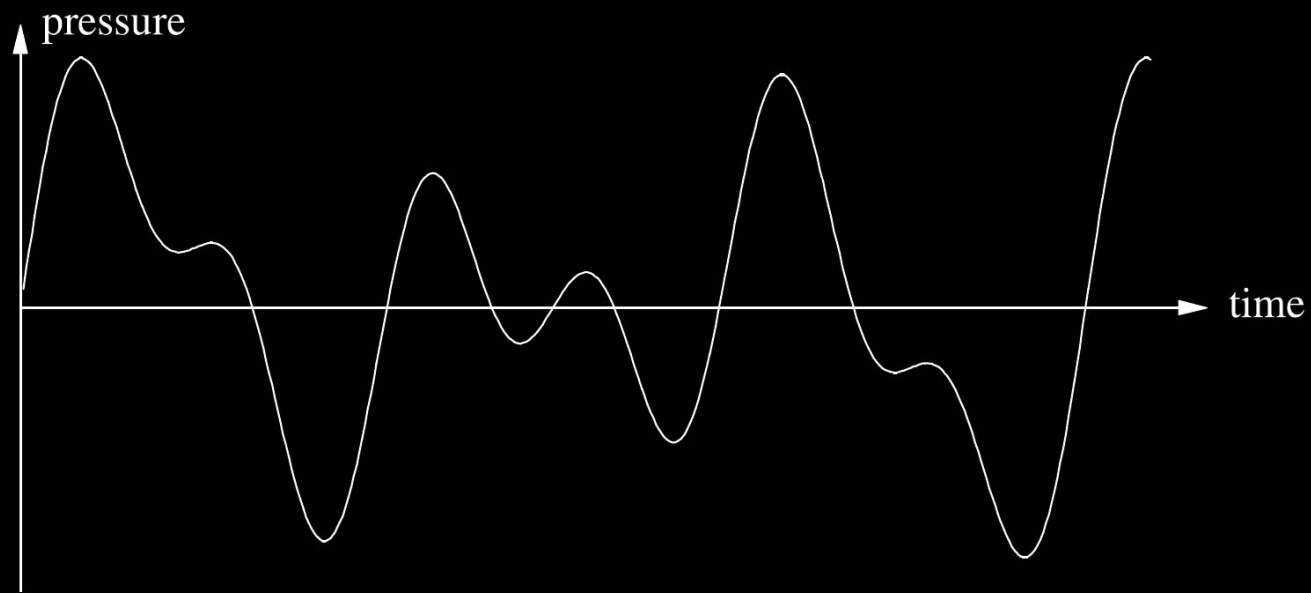
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<svg width="440" height="220" xmlns="http://www.w3.org/2000/svg">  
  <circle cx="60" cy="60" r="50" stroke="#0085C7" stroke-width="10" fill="none" />  
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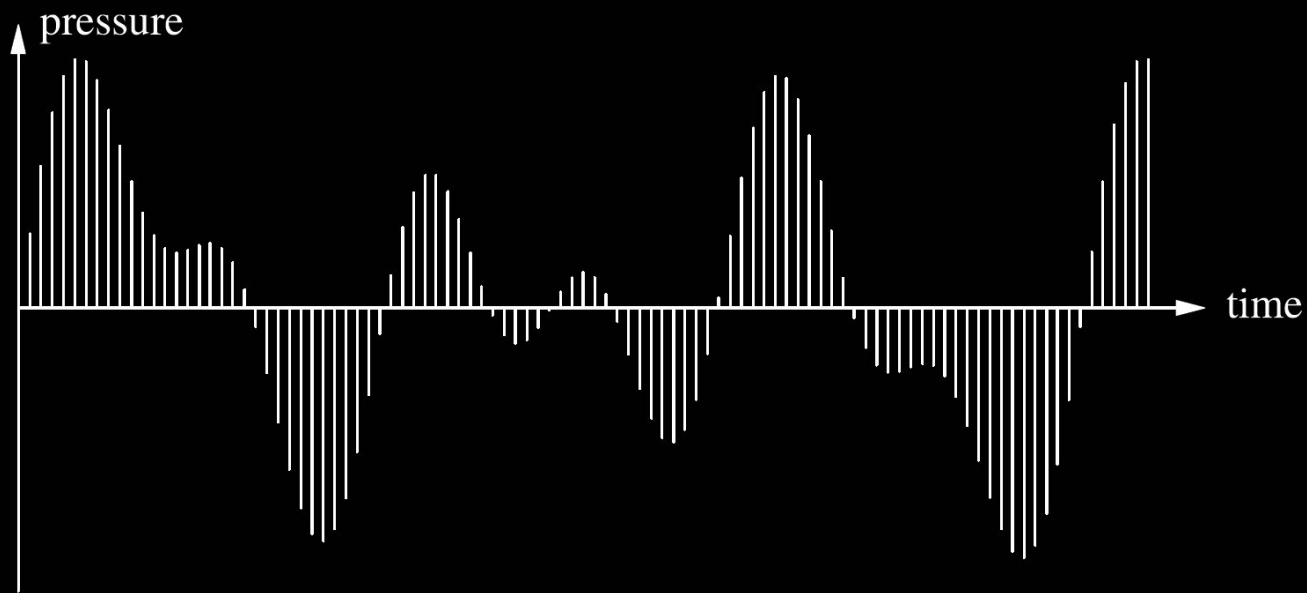




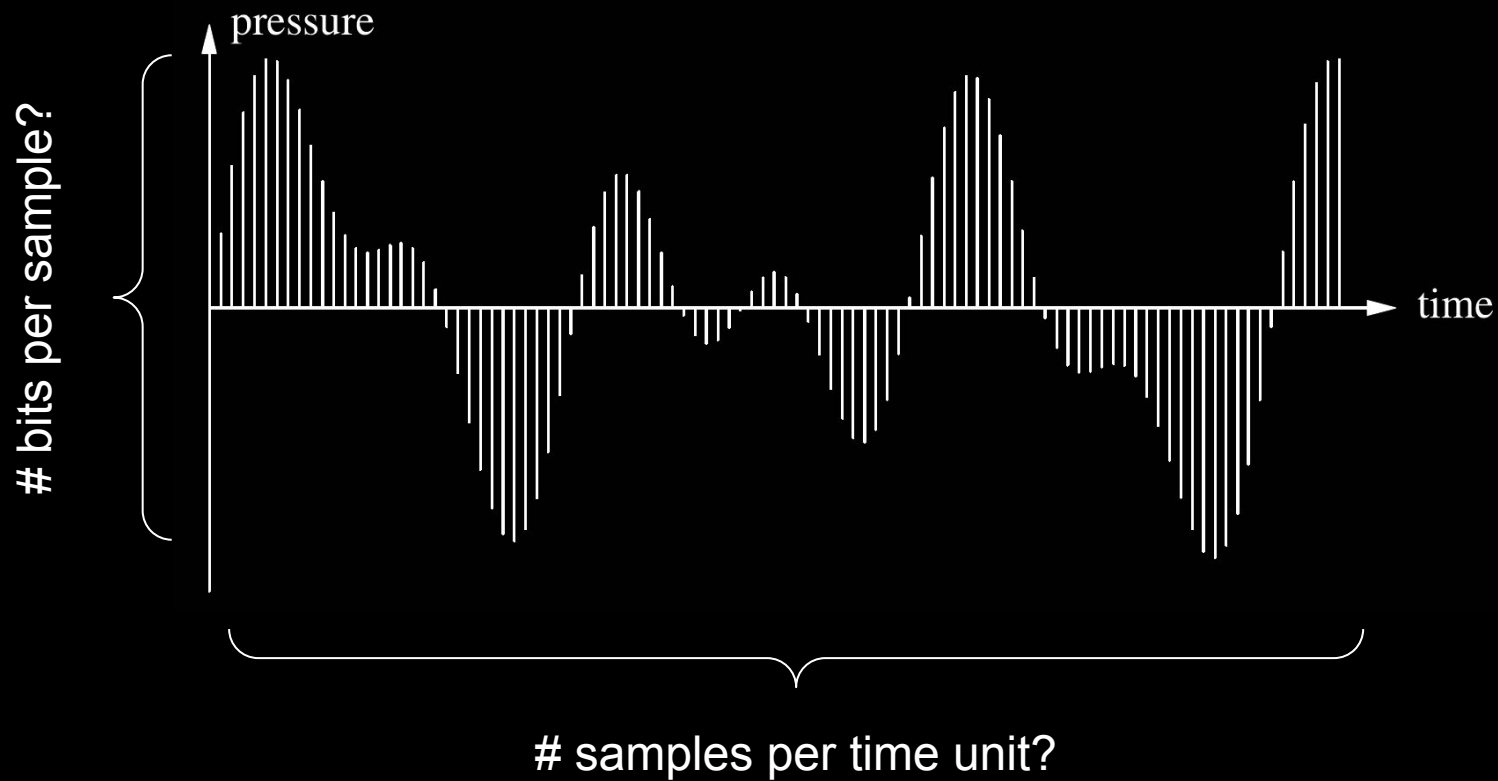
a a

representing sound

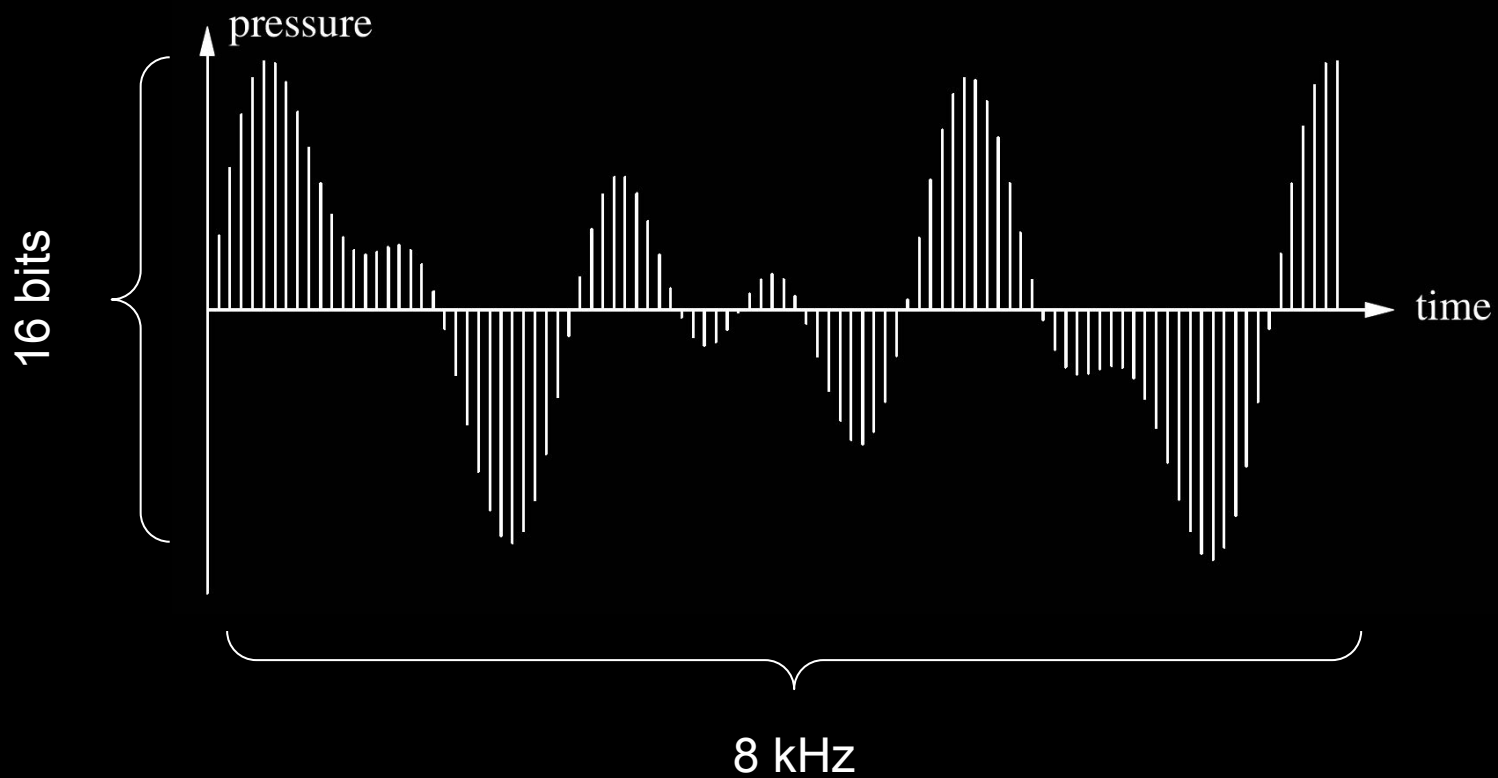




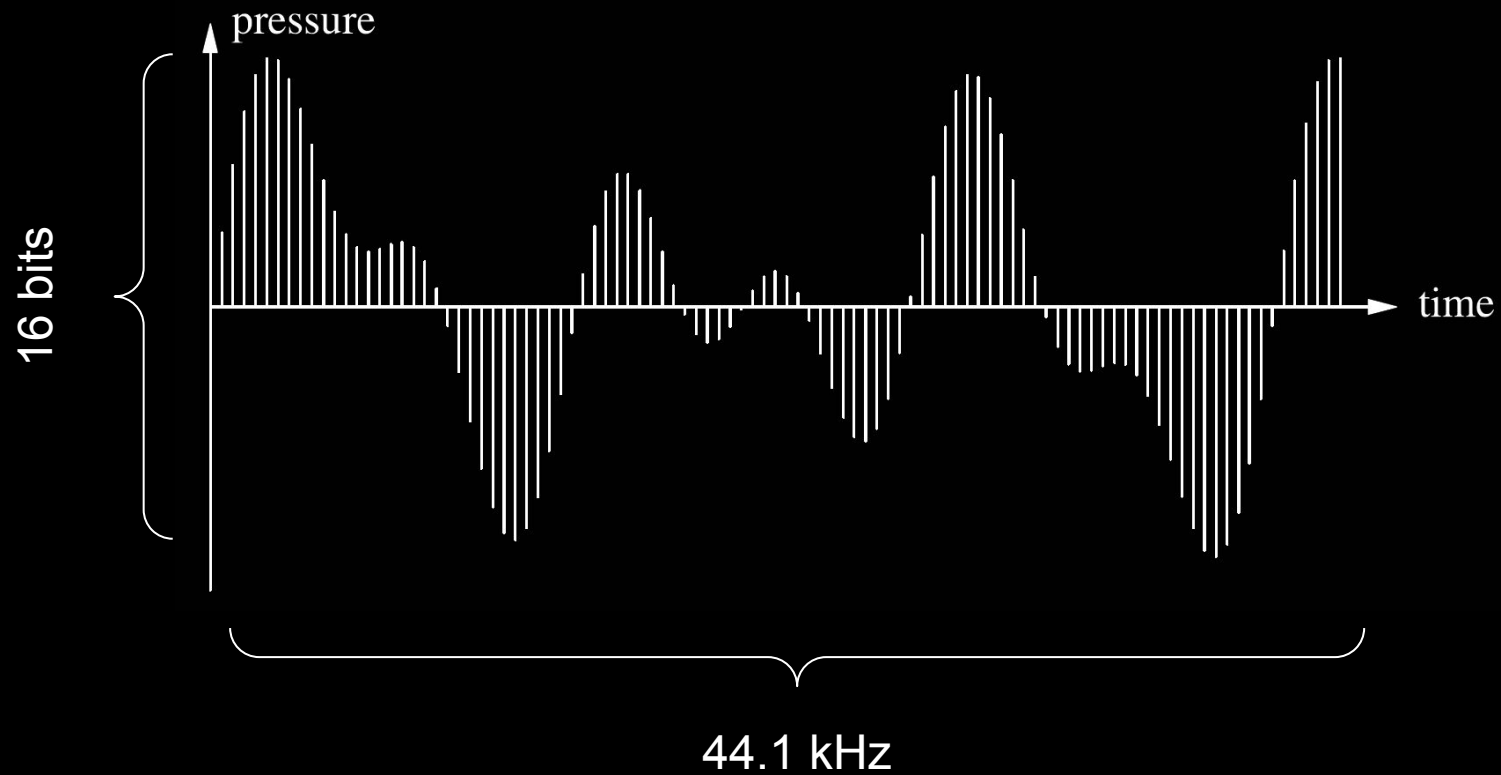
how many samples per time unit?



telephone

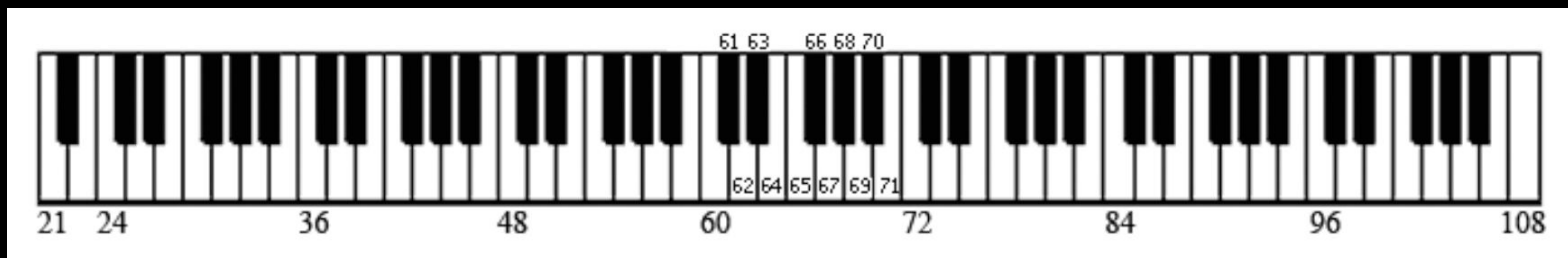


music



musical instrument digital interface
(MIDI)

byte 1 = note
byte 2 = velocity



what code systems exist outside
of computers?

a)



b)



c)



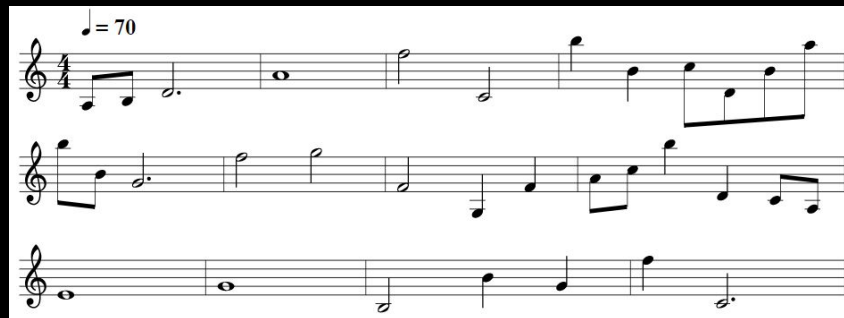
d)

MORSE CODE
(ALPHABETICAL)

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 —···
1 ·———	6 —····
2 ··———	7 —·····
3 ···———	8 —·····
4 ····—	9 —·····
5 ·····	0 ————

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e)



f)

