3

Data and Storage

Agenda

- Binary Number System
- Number Representation
- Letter Representation
- Voice Representation
- Image and Video Representation
- Bits and Bytes

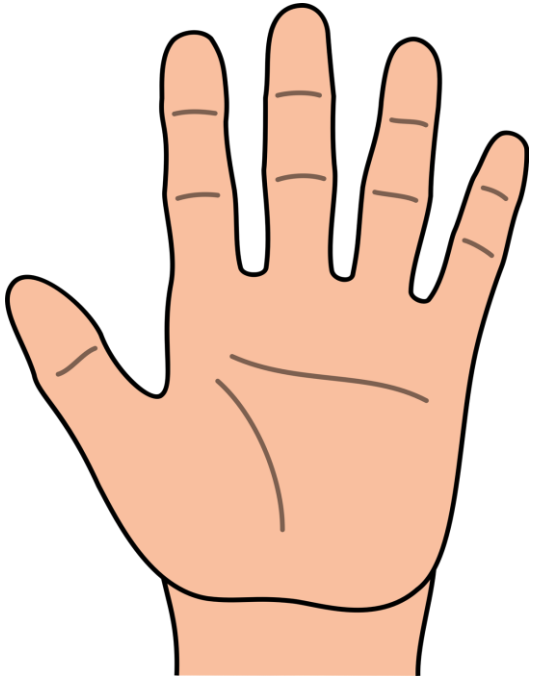
Binary Number System

- **decimal**
  - **0, 1, 2, 3, 4, 5, 6, 7, 8, 9,**

Binary Number System

- **binary**
  - **0, 1**

Binary Number System



Binary Number System

123

Binary Number System

1X100 + 2x10 + 3x1 = 123

Binary Number System

4 2 1

000

Binary Number System

4 2 1

001

Binary Number System

4 2 1

010

Binary Number System

4 2 1

011

Binary Number System

4 2 1

100

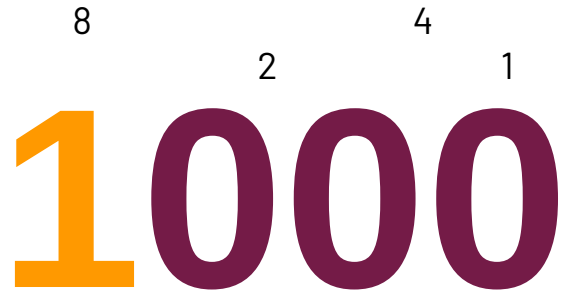
Binary Number System

4 2 1

111

$$\overset{4}{1}\overset{2}{1}\overset{1}{1}+1= \ ?$$

Binary Number System

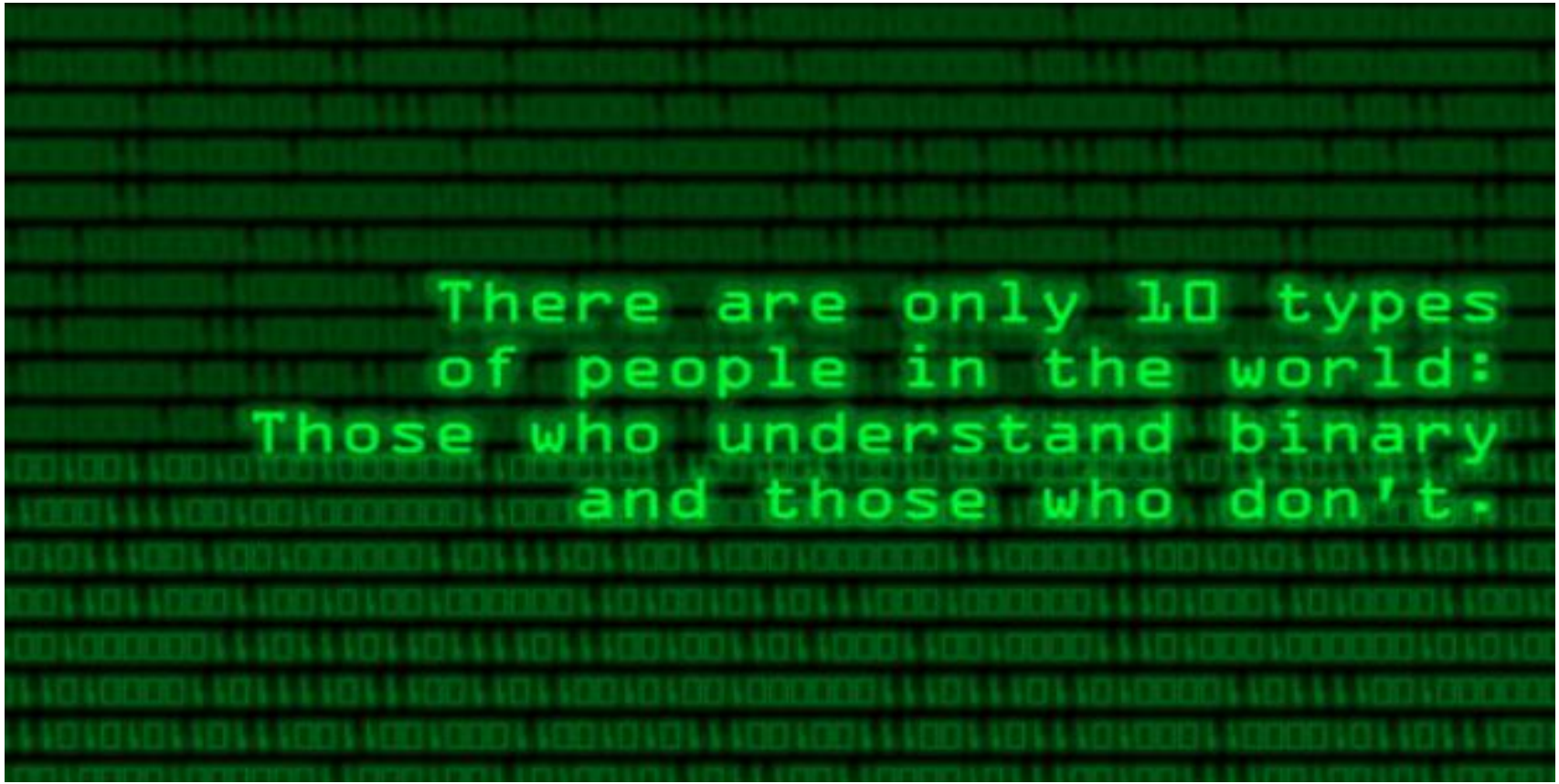


Binary Number System

100 10 1

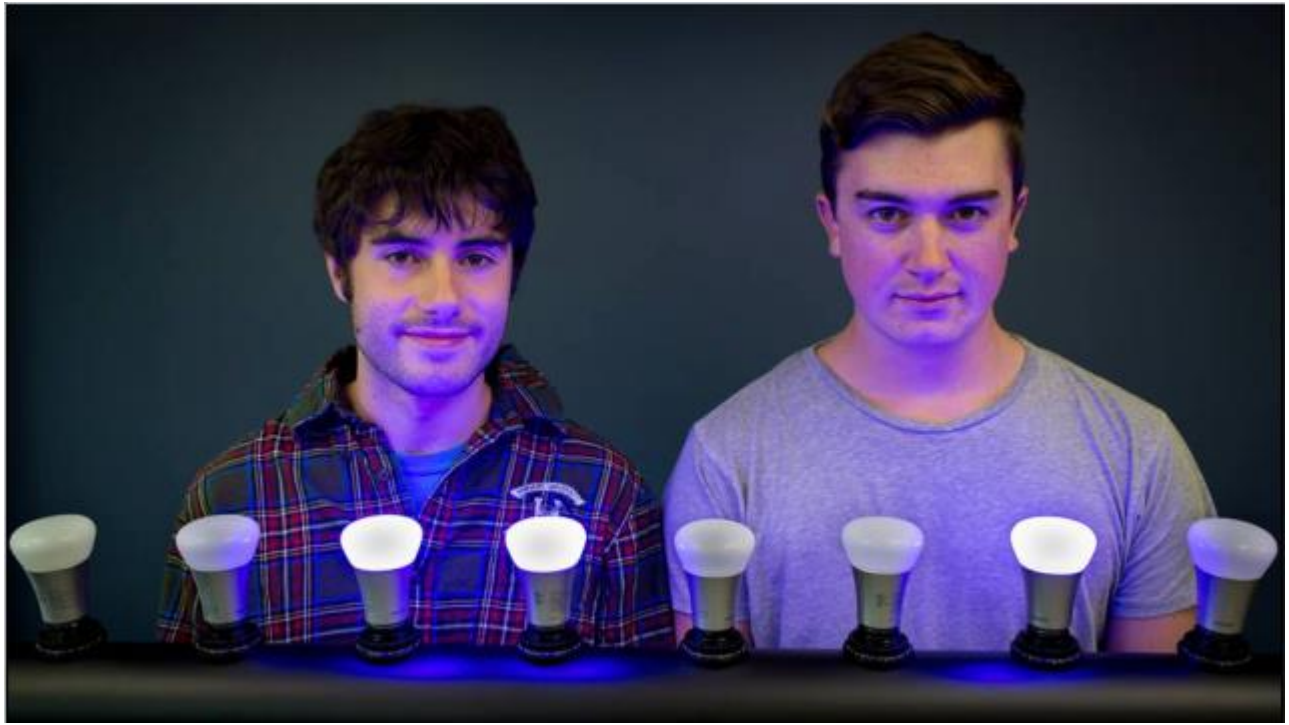
999

Binary Number System


There are only 10 types
of people in the world:
Those who understand binary
and those who don't.

Binary Number System

- **Click to image:**



Let's practice

128	64	32	16	8	4	2	1

Choose a response

Choose the binary number system representation of 14

A. 1 1 1 0
B. 1 0 1 0
C. 1 0 0 0
D. 1 1 1 1
E. 1 0 0 1

How about 50?

110010	110111
111101	110101

Students, drag the icon!

Binary Number System

1001

Students, enter a number!

Binary Number System

11010 = ? in decimal

Number Representation

- Numbers are represented as integers.

Data Type	Operator used	Description
String	str	Text or numbers that can be combined in a print statement.
Integer	int	Whole number with no decimal part. Used to do calculations
Float	float	Real number with a decimal part. Use to do calculations.

Letter Representation

- ASCII: American Standard Code for Information Interchange

TABLE 3
ASCII CHARACTER CODES (DECIMAL)

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

Letter Representation

- ASCII: American Standard Code for Information Interchange

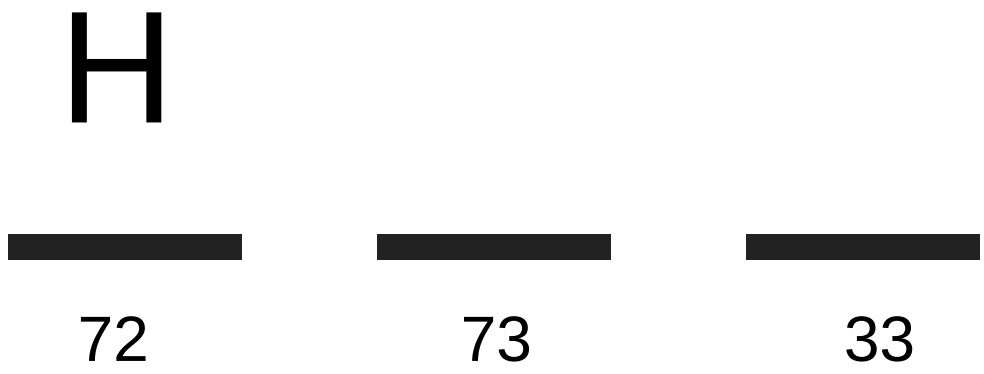
7 bits ---> 128 letters/symbols

Letter Representation

- ASCII: American Standard Code for Information Interchange

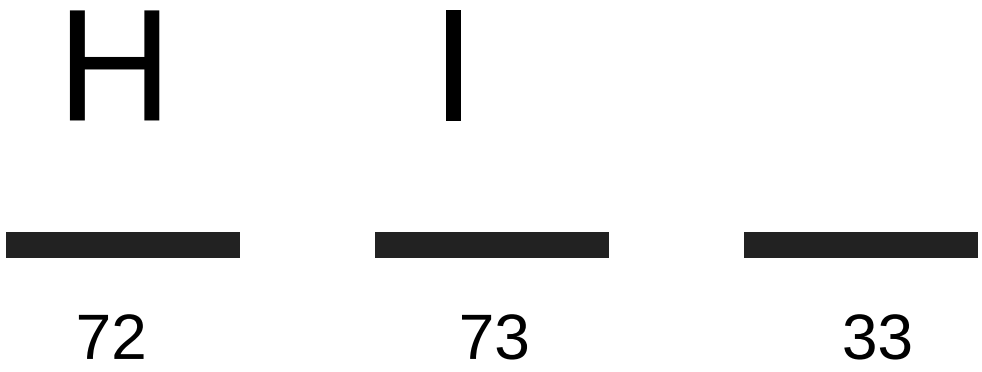
Letter Representation

- ASCII: American Standard Code for Information Interchange



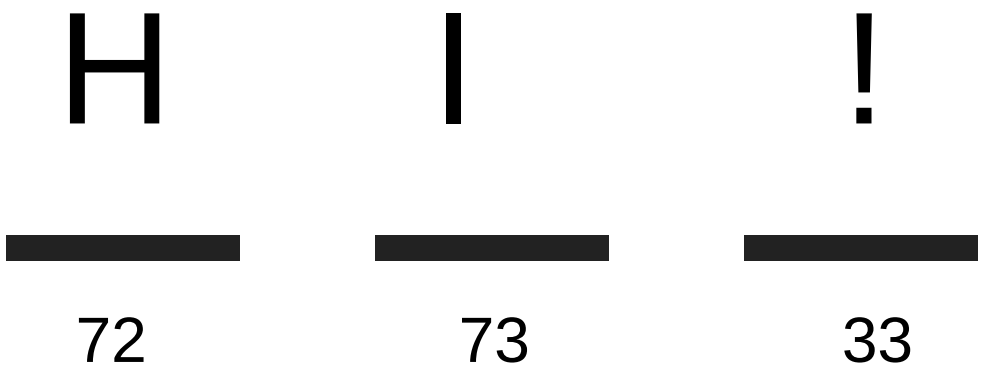
Letter Representation

- ASCII: American Standard Code for Information Interchange



Letter Representation

- ASCII: American Standard Code for Information Interchange

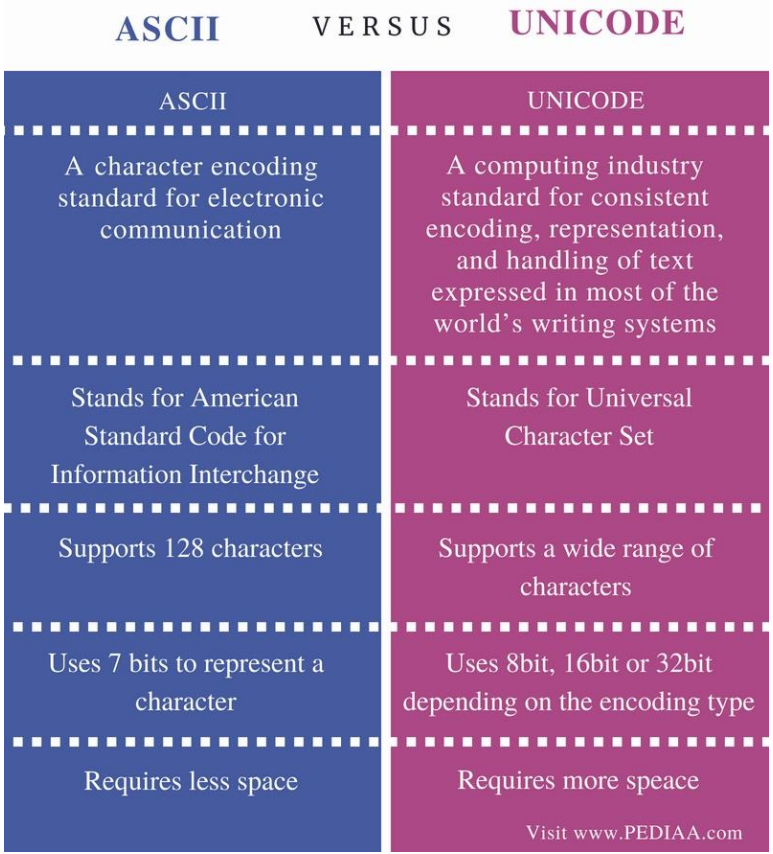


Letter Representation

- Unicode:

Bits of code point	First code point	Last code point	Bytes in sequence	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
7	U+0000	U+007F	1	0xxxxxxx					
11	U+0080	U+07FF	2	110xxxxx	10xxxxxx				
16	U+0800	U+FFFF	3	1110xxxx	10xxxxxx	10xxxxxx			
21	U+10000	U+1FFFFF	4	11110xxx	10xxxxxx	10xxxxxx	10xxxxxx		
26	U+200000	U+3FFFFFF	5	111110xx	10xxxxxx	10xxxxxx	10xxxxxx	10xxxxxx	
31	U+4000000	U+7FFFFFFF	6	1111110x	10xxxxxx	10xxxxxx	10xxxxxx	10xxxxxx	10xxxxxx

Letter Representation



Letter Representation

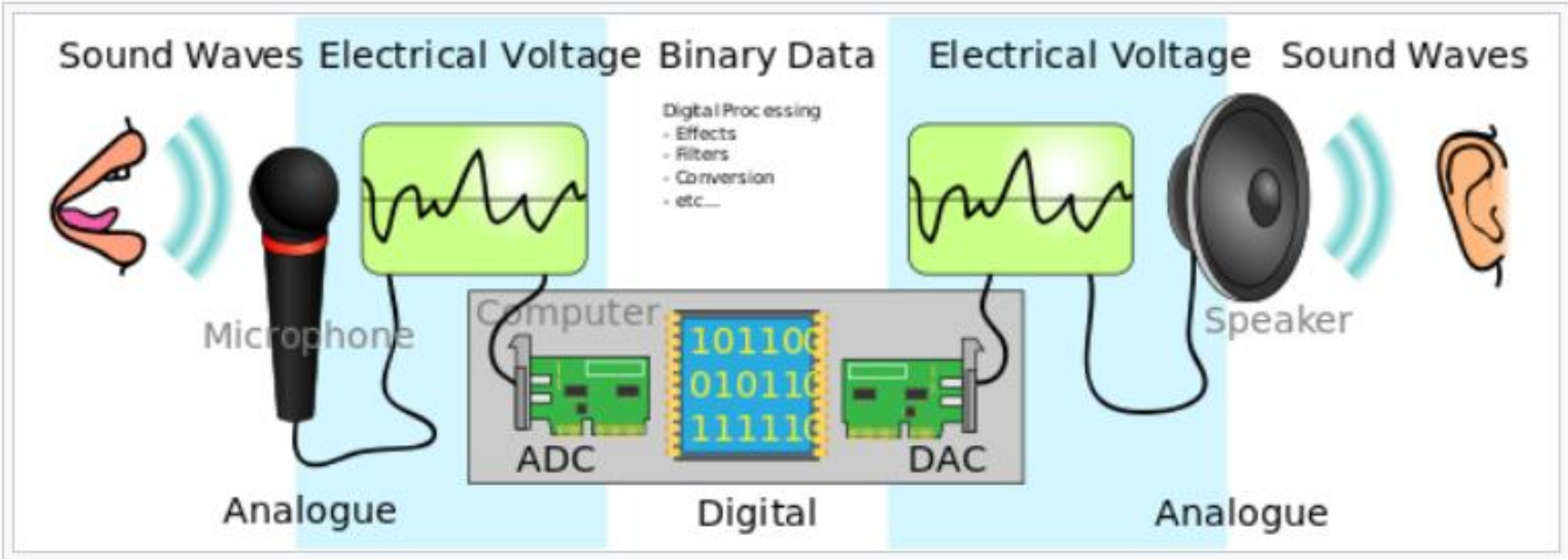
- Unicode:

U+1F606

U+1F69F

U+1F63F

Voice Representation



Voice Representation

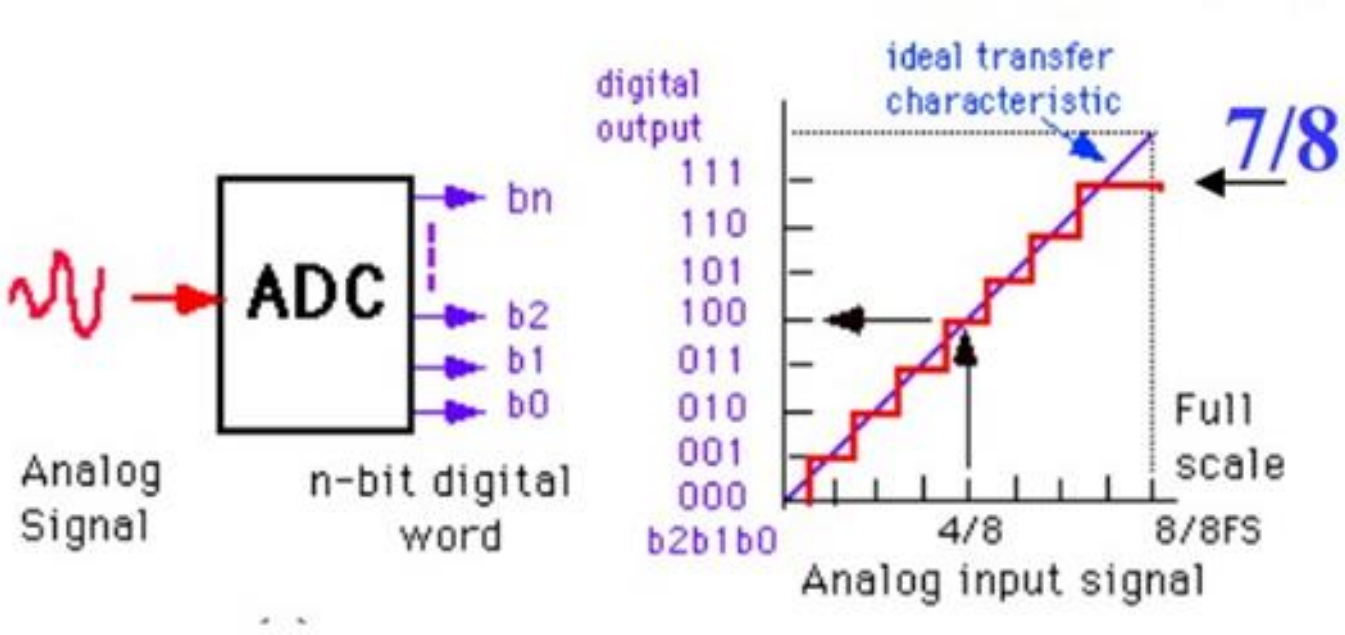


Image and Video Representation

- RGB (Red, Green Blue)

72	73	33

Image and Video Representation

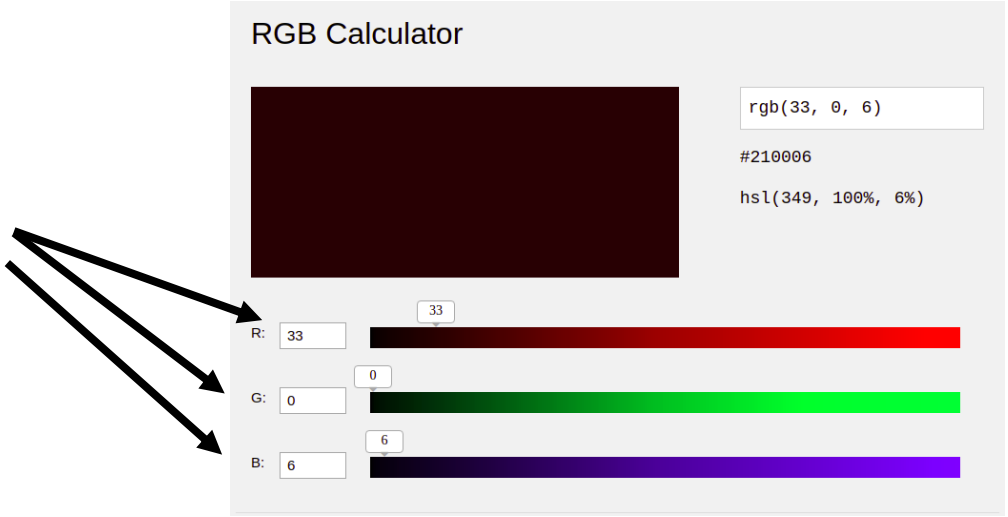


Image and Video Representation

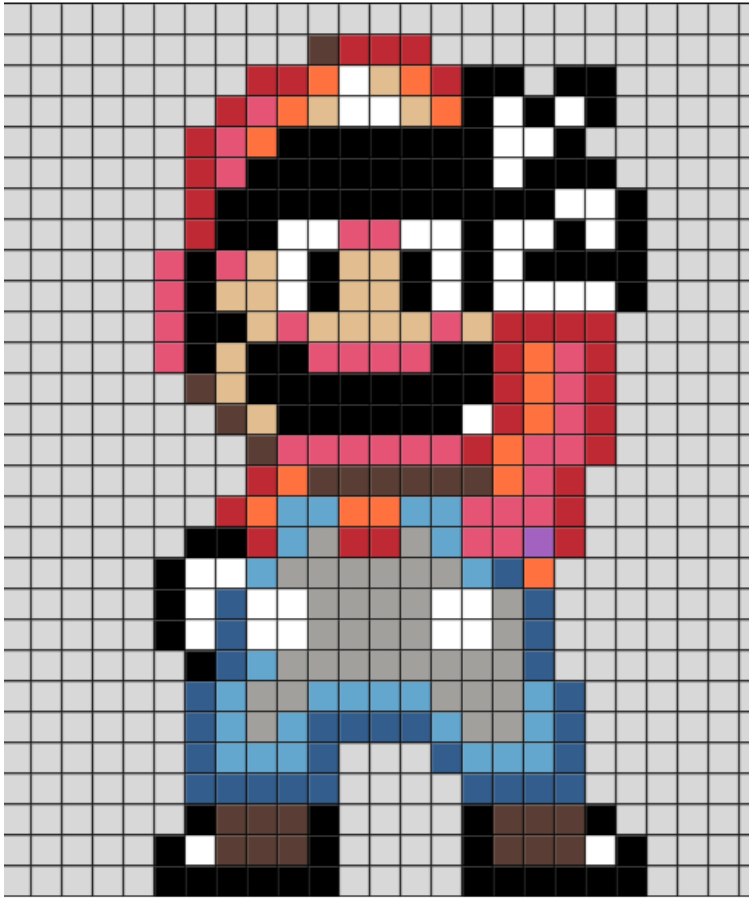
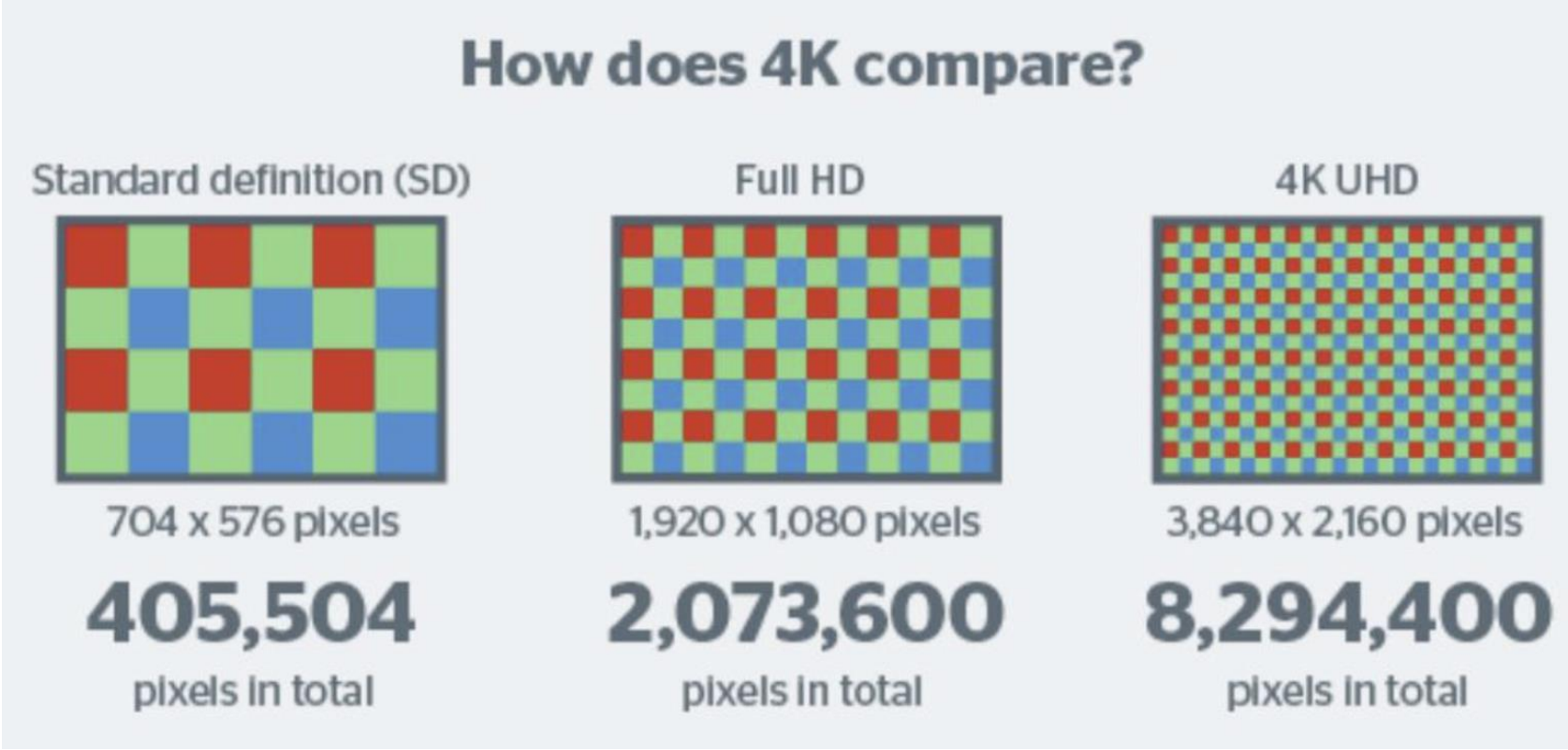


Image and Video Representation



How well did you like this section?

Bits and Bytes

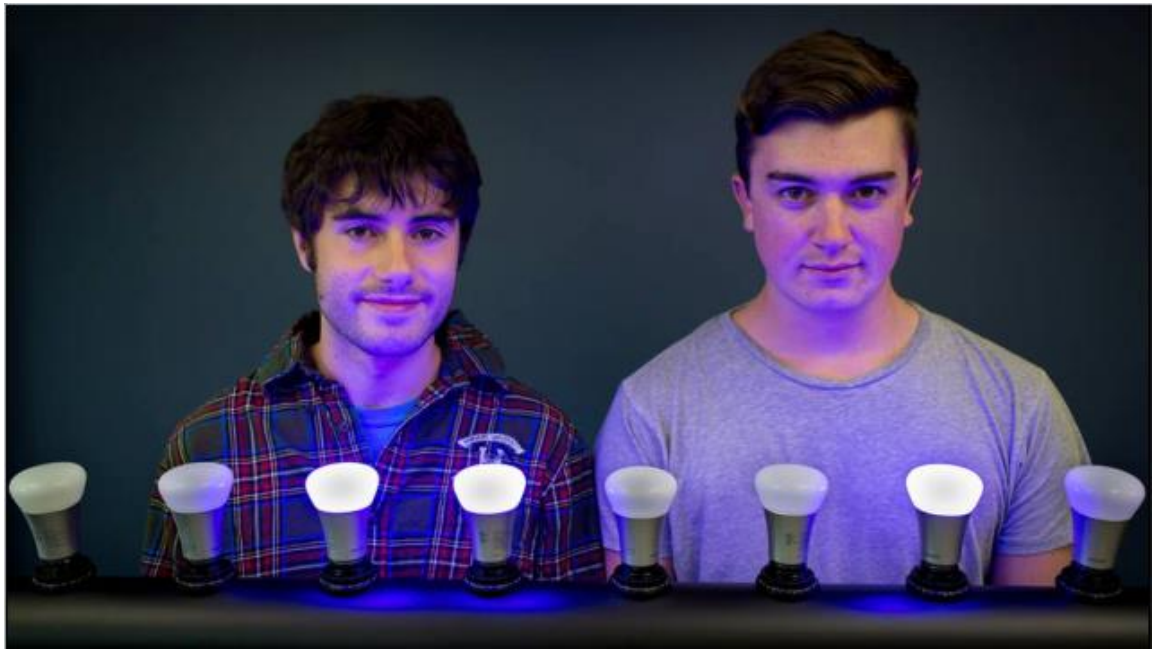
Bit

- **0/1**
- **true/false**
- **yes,no**

Bits and Bytes

Byte

- **8 bits**



Bits and Bytes

Kilobyte

- **1000 bytes**
- **8000 bits**

Bits and Bytes

Kilobyte

- ~~1000~~ 1024 bytes
- ~~8000~~ 8192 bits

Bits and Bytes

Kilobyte

- **2^{10}** bytes

Bits and Bytes

Bits and Bytes

Megabyte

- **2^{10}** kilobytes
- **2^{20}** bytes
- 1024 kilobytes

Bits and Bytes

Bits and Bytes

Gigabyte

- 2^{10} megabytes
- 2^{20} kilobytes
- 2^{30} bytes
- 1024 megabytes

Bits and Bytes

Bits and Bytes

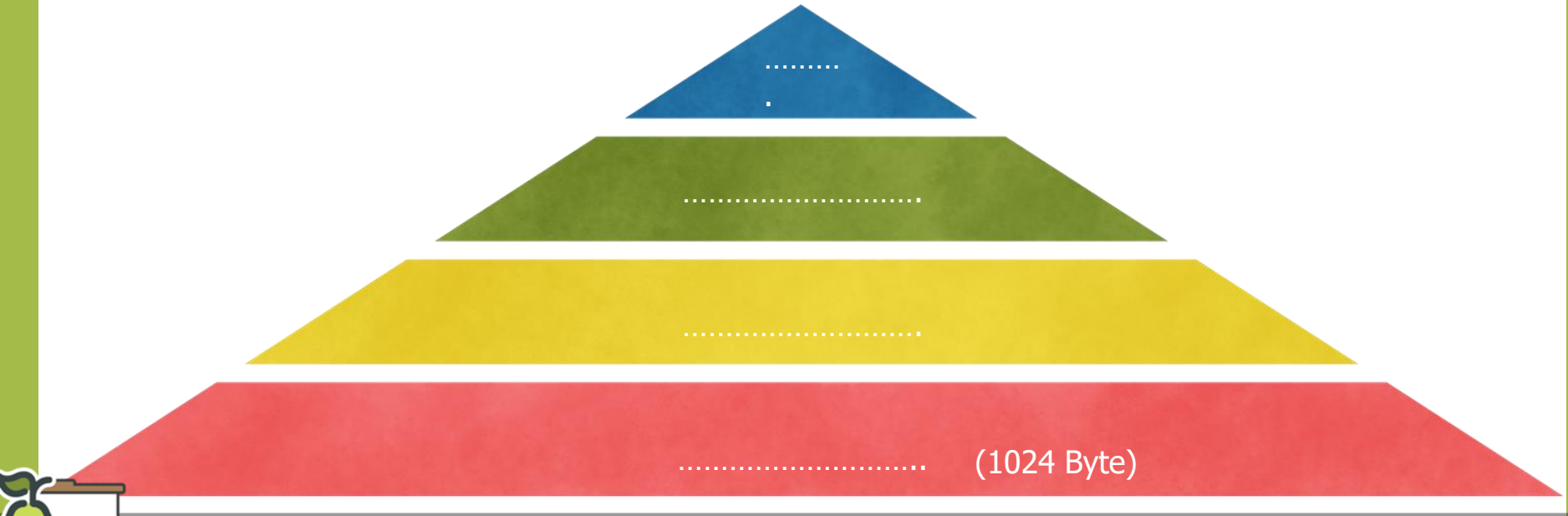
Terabyte

- 2^{10} gigabytes
- 2^{20} megabytes
- 2^{30} kilobytes
- 2^{40} bytes
- 1024 gigabytes

Bits and Bytes

bytEgyptian pyramids

Let’s write to bits and bytes pyramid.




Kahoot!

Circle how you are feeling:

Students, draw anywhere on this slide!

THANKS!

Any questions?

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