



3

Data and Storage

Agenda



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



Binary Number System

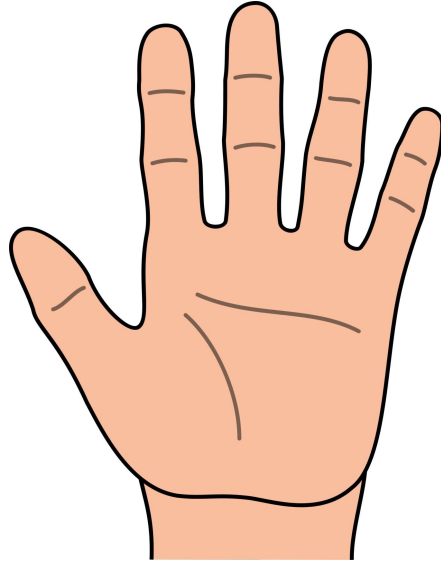
- **decimal**
 - 0, 1, 2, 3, 4, 5, 6, 7, 8, 9,



Binary Number System

- **binary**
 - 0, 1

► Binary Number System



► Binary Number System



123

► Binary Number System



100 10 1
123

$$1 \times 100 + 2 \times 10 + 3 \times 1 = 123$$

► 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
1 1 1

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4 2 1
1 1 1 + 1 = ?



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14

► Binary Number System



8 4 2 1
1000

► Binary Number System

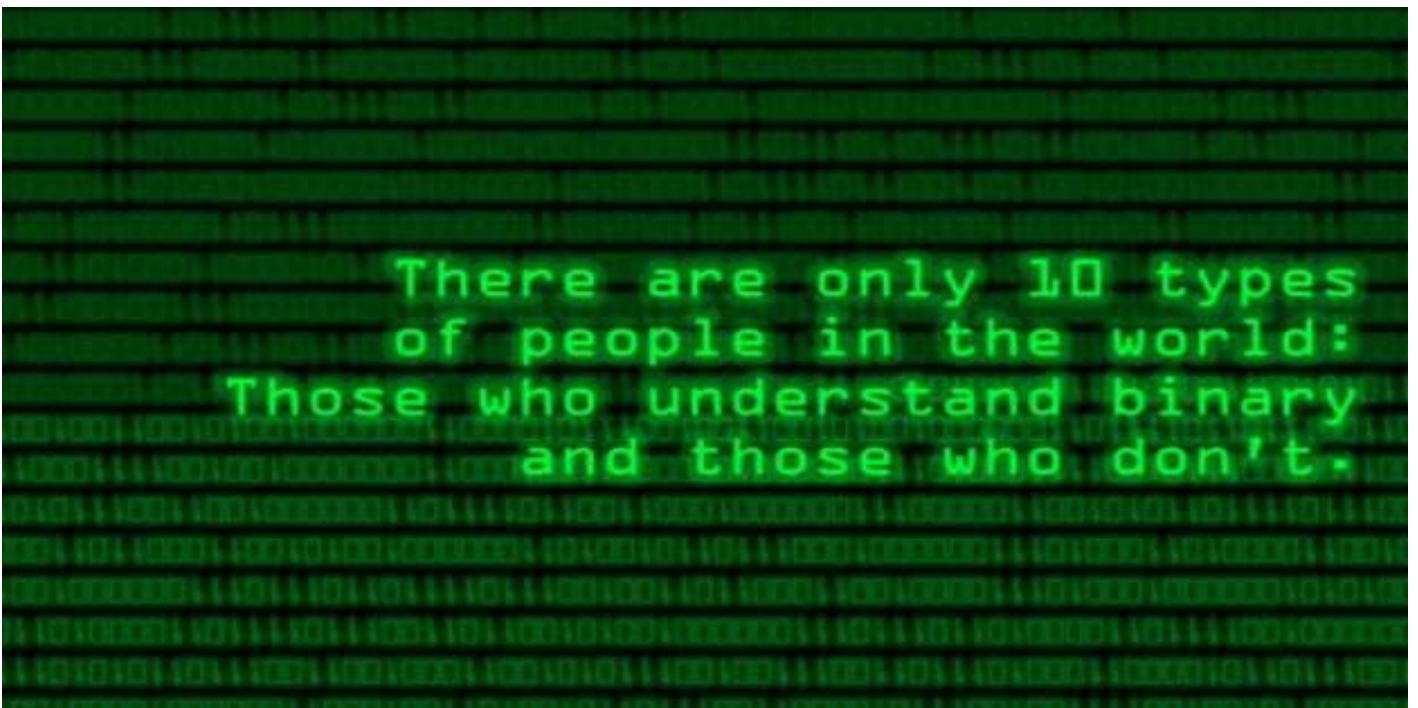


100 10 1
999

Binary Number System



1000 100 10 1
1000



Binary Number System



- Click to image:



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Let's practice



128	64	32	16	8	4	2	1

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Choose a response

Choose the binary number system representation of 14

- A. 1110
- B. 1010
- C. 1000
- D. 1111
- E. 1001



Students choose an option

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How about 50?

110010

110111

111101

110101



Students, drag the icon!

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► Binary Number System



1001



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Students, enter a number!

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23

► Binary Number System



11010 = ? in
decimal



SWAY©
STAY YOURSELF

Students, enter a number!

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24

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



72



73



33

▶ Letter Representation



- ASCII: American Standard Code for Information Interchange

H



72



73



33

▶ Letter Representation



- ASCII: American Standard Code for Information Interchange

H

I



72



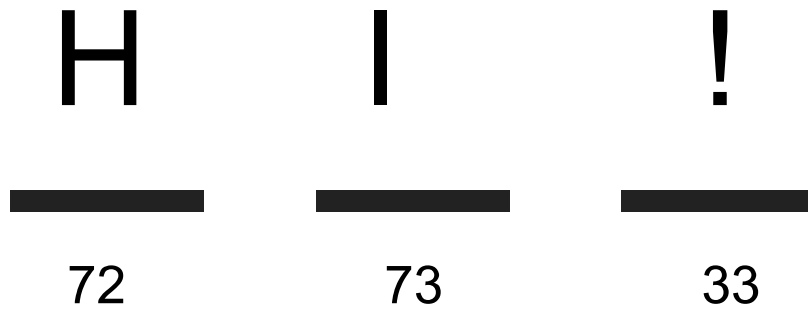
73



33

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+3FFFFFFF	5	111110xx	10xxxxxx	10xxxxxx	10xxxxxx	10xxxxxx	
31	U+4000000	U+7FFFFFFF	6	1111110x	10xxxxxx	10xxxxxx	10xxxxxx	10xxxxxx	10xxxxxx



Letter Representation

ASCII	VERSUS	UNICODE
ASCII		UNICODE
A character encoding standard for electronic communication		A computing industry standard for consistent encoding, representation, and handling of text expressed in most of the world's writing systems
Stands for American Standard Code for Information Interchange		Stands for Universal Character Set
Supports 128 characters		Supports a wide range of characters
Uses 7 bits to represent a character		Uses 8bit, 16bit or 32bit depending on the encoding type
Requires less space		Requires more space
		Visit www.PEDIAA.com

Letter Representation



- Unicode:



U+1F606

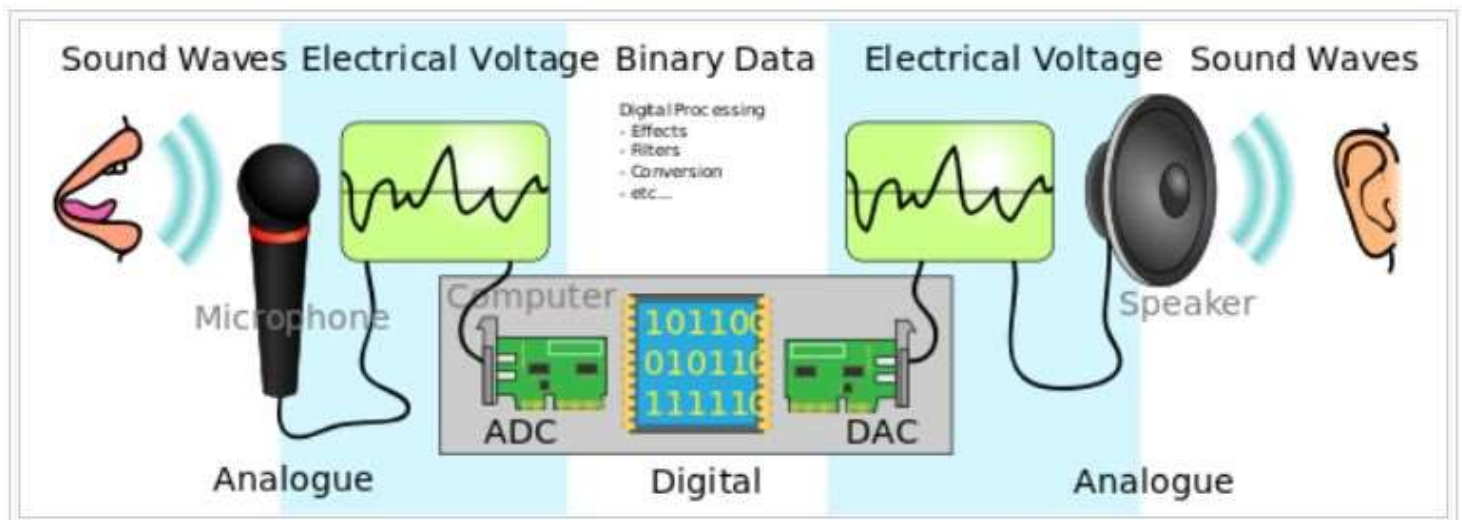


U+1F69F



U+1F63F

Voice Representation



Voice Representation

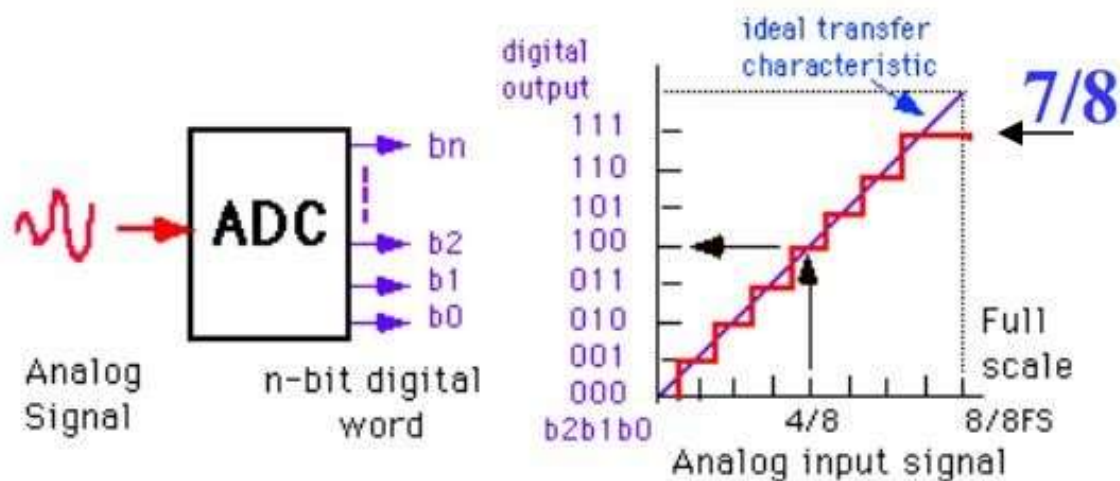


Image and Video Representation



- RGB (Red, Green Blue)




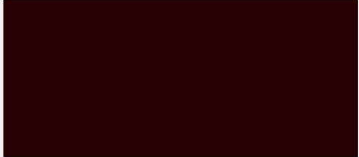
		
72	73	33



Image and Video Representation




RGB Calculator





rgb(33, 0, 6)

#210006

hsl(349, 100%, 6%)

R: 

G: 

B: 

Three arrows point from the input fields for R, G, and B to the corresponding color bars.



Image and Video Representation

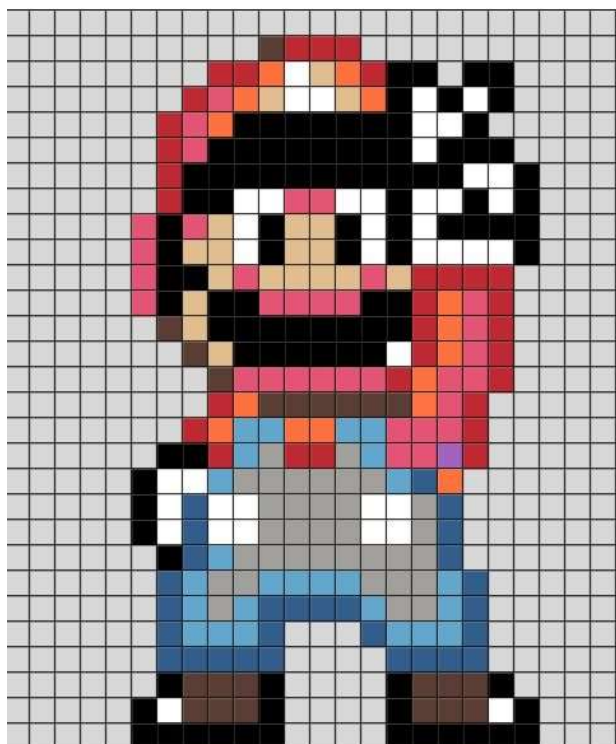
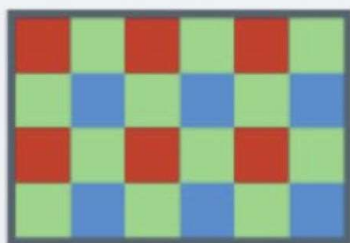


Image and Video Representation



How does 4K compare?

Standard definition (SD)

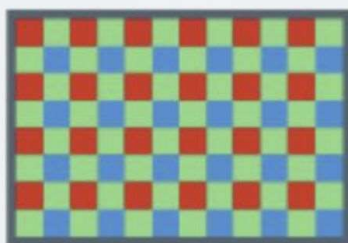


704 x 576 pixels

405,504

pixels in total

Full HD

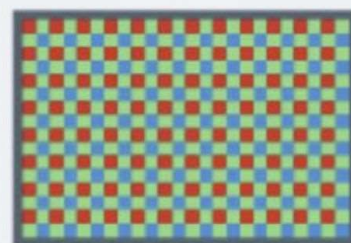


1,920 x 1,080 pixels

2,073,600

pixels in total

4K UHD



3,840 x 2,160 pixels

8,294,400

pixels in total

How well did you like this section?



Students, drag the icon!

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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

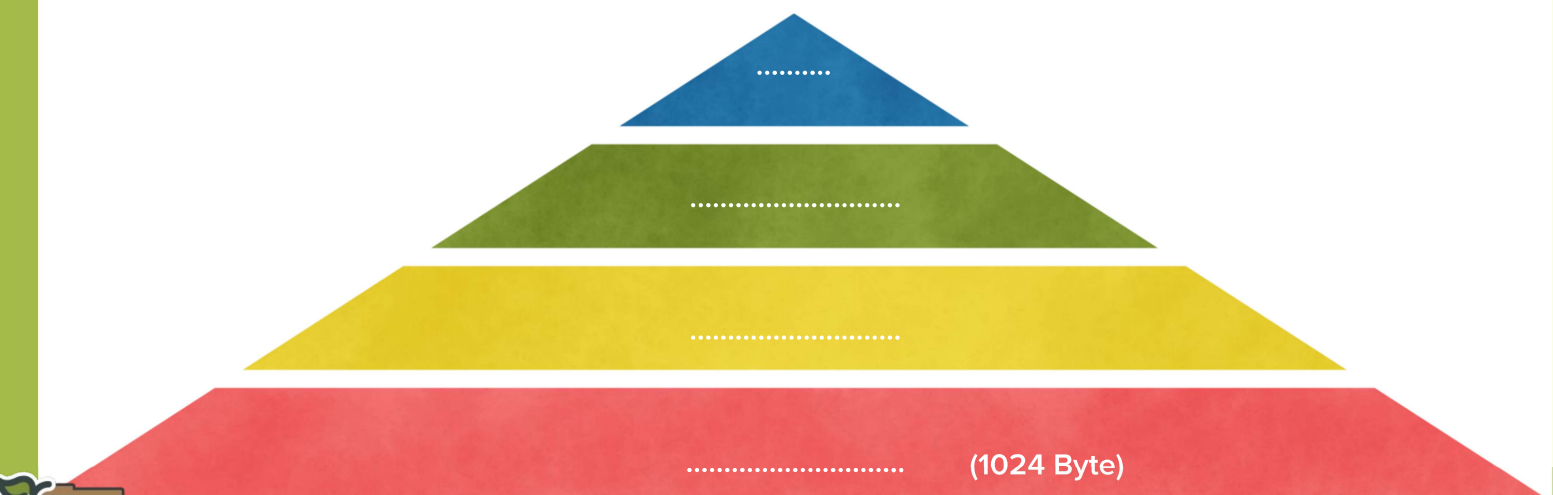


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bytEgyptian pyramids

Let's write to bits and bytes pyramid.



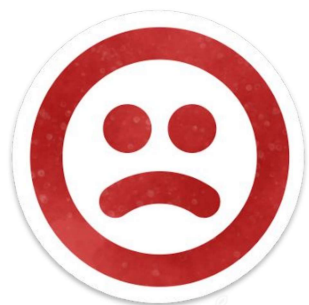
Students, draw anywhere on this slide!

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Kahoot!

55

Circle how you are feeling:



Pear Deck



Students, draw anywhere on this slide!

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THANKS!

Any questions?

You can find us at:

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- ▶ jamil@clarusway.com
- ▶ @Tomy
- ▶ tomy@clarusway.com

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