Computer Fundamentals

Data and Storage

Agenda

▶ Binary Number System

▶ Number Representation

▶ Letter Representation

▶ Voice Representation

▶ Image and Video Representation

▶ Bits and Bytes

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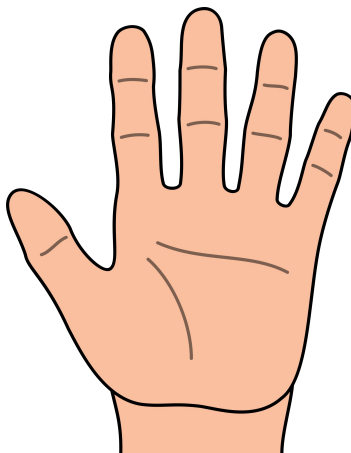
- **decimal**
  - **0, 1, 2, 3, 4, 5, 6, 7, 8, 9,**

Binary Number System

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

Binary Number System

Binary Number System

123

Binary Number System

100	10	1

123

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

4   2   1
111+1= ?

Binary Number System

8   4   2   1
1000

Binary Number System

100   10   1

999

Binary Number System

1000   100   10   1

1000
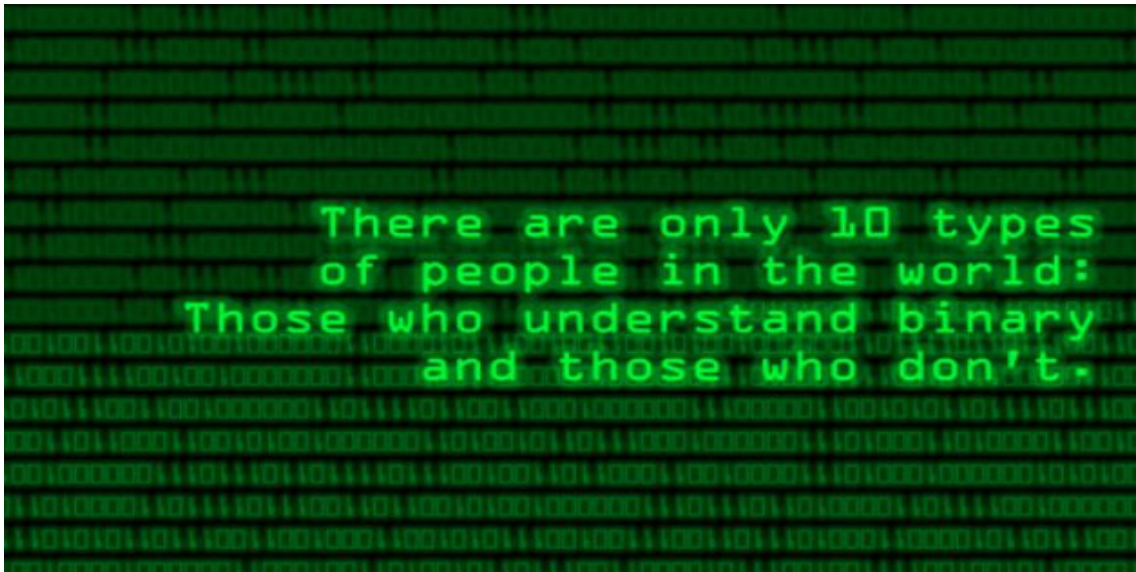
Binary Number System

- **Click to image:**

128	64	32	16	8	4	2	1

Choose a response

Choose the binary number system representation of 14

A. 1110

B. 1010

C. 1000

D. 1111

E. 1001

How about 50?

110010   **110111**

111101   **110101**

Binary Number System

1001

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.

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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

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Letter Representation

- ASCII: American Standard Code for Information Interchange

H

72	73	33

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Letter Representation

- ASCII: American Standard Code for Information Interchange

H   I

72   73   33

Letter Representation

- ASCII: American Standard Code for Information Interchange

H   I   !

72   73   33

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

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 speace

Visit www.PEDIAA.com

Letter Representation

- Unicode:

😆 🤯 😻

U+1F606   **U+1F69F**   **U+1F63F**

Voice Representation

Sound Waves Electrical Voltage Binary Data Electrical Voltage Sound Waves

Digital Processing
- Effects
- Filters
- Conversion
- etc....

Microphone   Computer   Speaker
                  101100
                  010110
                  111110
                  ADC   DAC

Analogue   Digital   Analogue
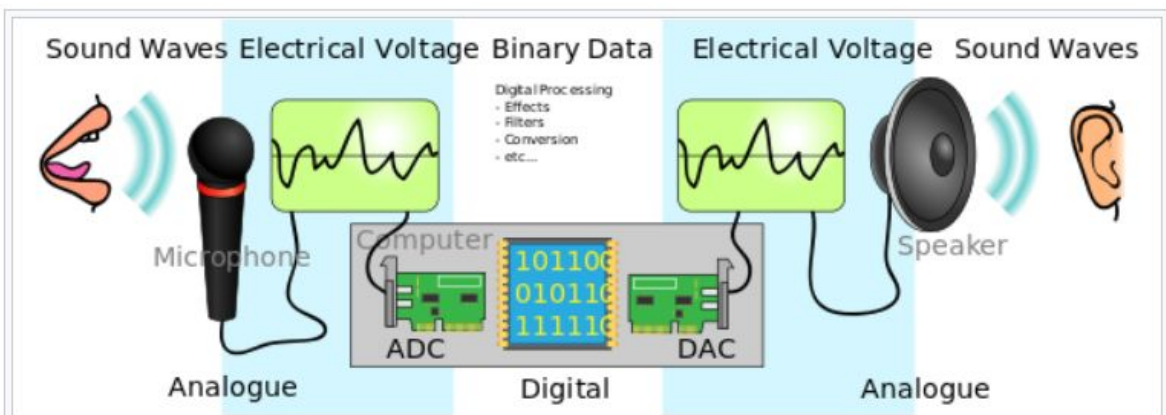
Voice Representation
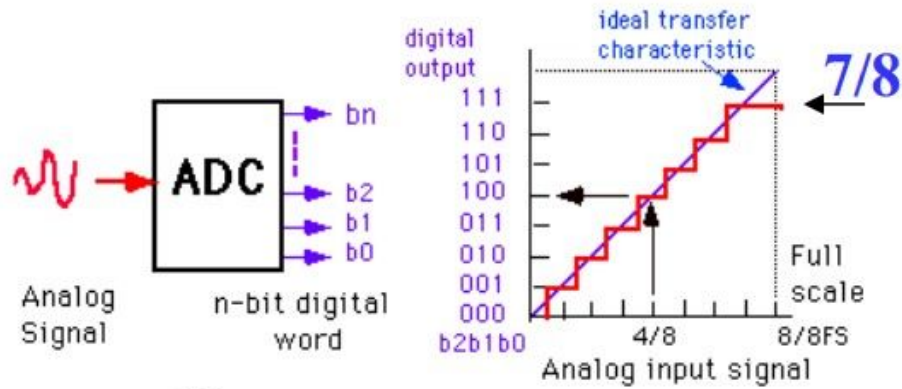
Image and Video Representation

- RGB (Red, Green Blue)

| 72 | 73 | 33 |

Image and Video Representation

RGB Calculator

rgb(33, 0, 6)

#210006

hsl(349, 100%, 6%)

R: 33

33

G: 0

0

B: 6

6
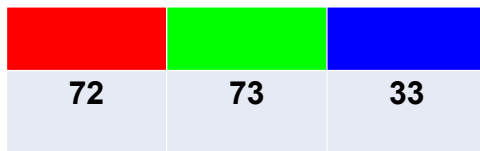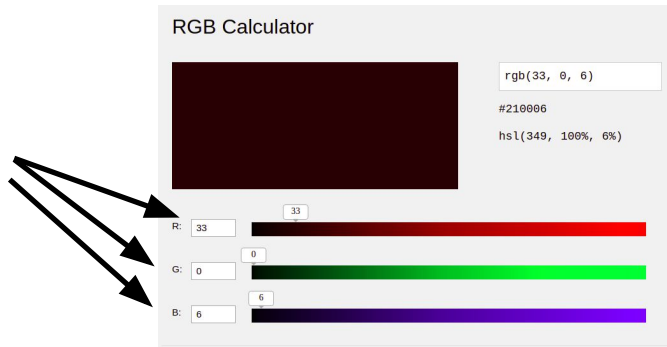
Students choose an option

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Image and Video Representation
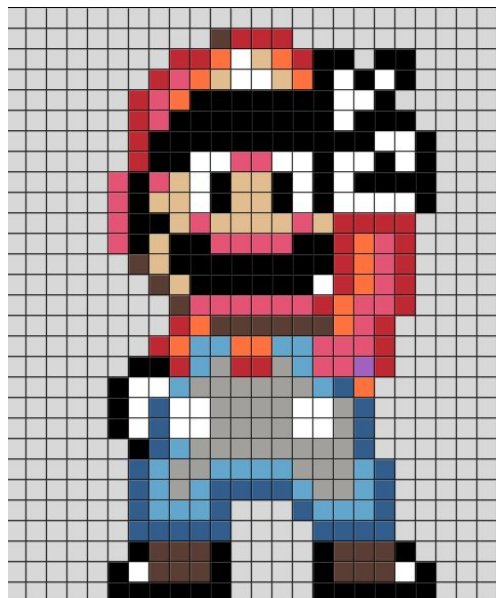
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Image and Video Representation
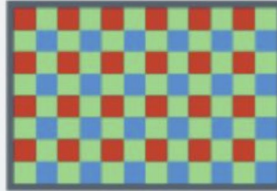
How does 4K compare?

Standard definition (SD)	Full HD	4K UHD
704 x 576 pixels	1,920 x 1,080 pixels	3,840 x 2,160 pixels
405,504	**2,073,600**	**8,294,400**
pixels in total	pixels in total	pixels in total
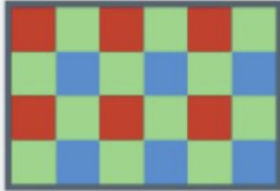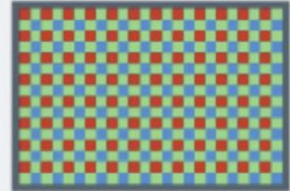
How well did you like this section?

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
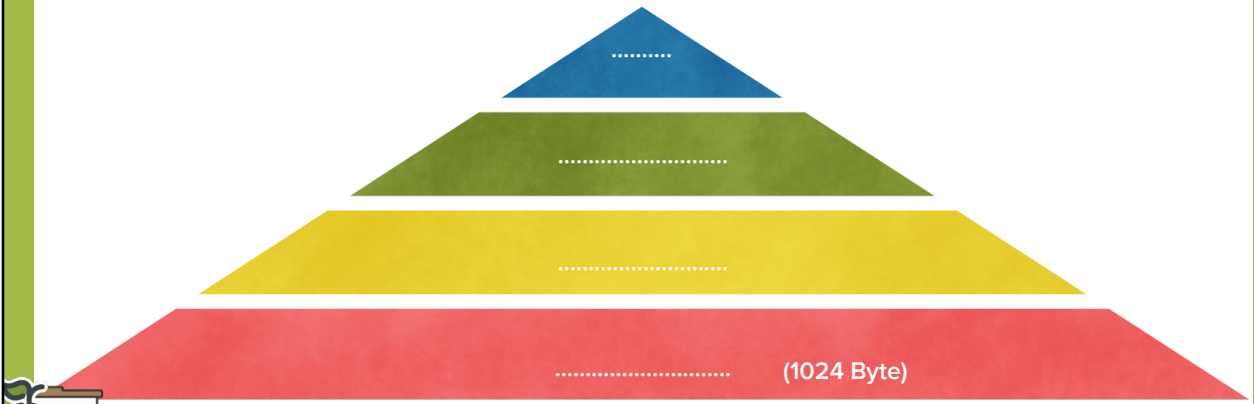- 2^{30} kilobytes
- 2^{40} bytes
- 1024 gigabytes

Bits and Bytes

bytEgyptian pyramids

Let's write to bits and bytes pyramid.

(1024 Byte)

Circle how you are feeling:

THANKS!
Any questions?