



Computer Fundamentals





Data and Storage





Agenda

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

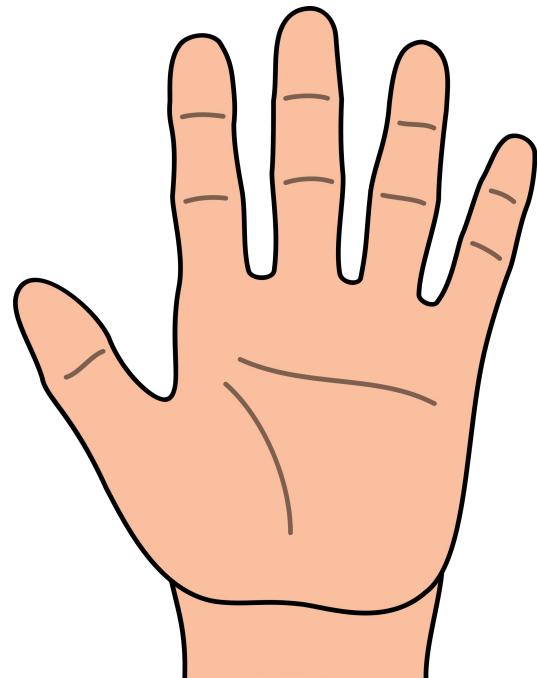
Binary Number System

- **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

0 0 0

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

$$111 + 1 = ?$$



JSWAY[©]
REINVENT YOURSELF

Students, write your response!

Binary Number System

100 10 1
999

Binary Number System

1000 100 10 1
1 000

Binary Number System

8 4 2 1
1000



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



Students choose an option

How about 50?

110010

110111

111101

110101



Students, drag the icon!



Binary Number System

1 001



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ENT YOURSELF

Students, enter a number!

Pear Deck Interactive Slide
Do not remove this bar

Binary Number System

**11010 = ? in
decimal**



USWAY[©]
ENT YOURSELF

Students, enter a number!

Pear Deck Interactive Slide
Do not remove this bar

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	Q	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-`	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

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+1FFFFFFF	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

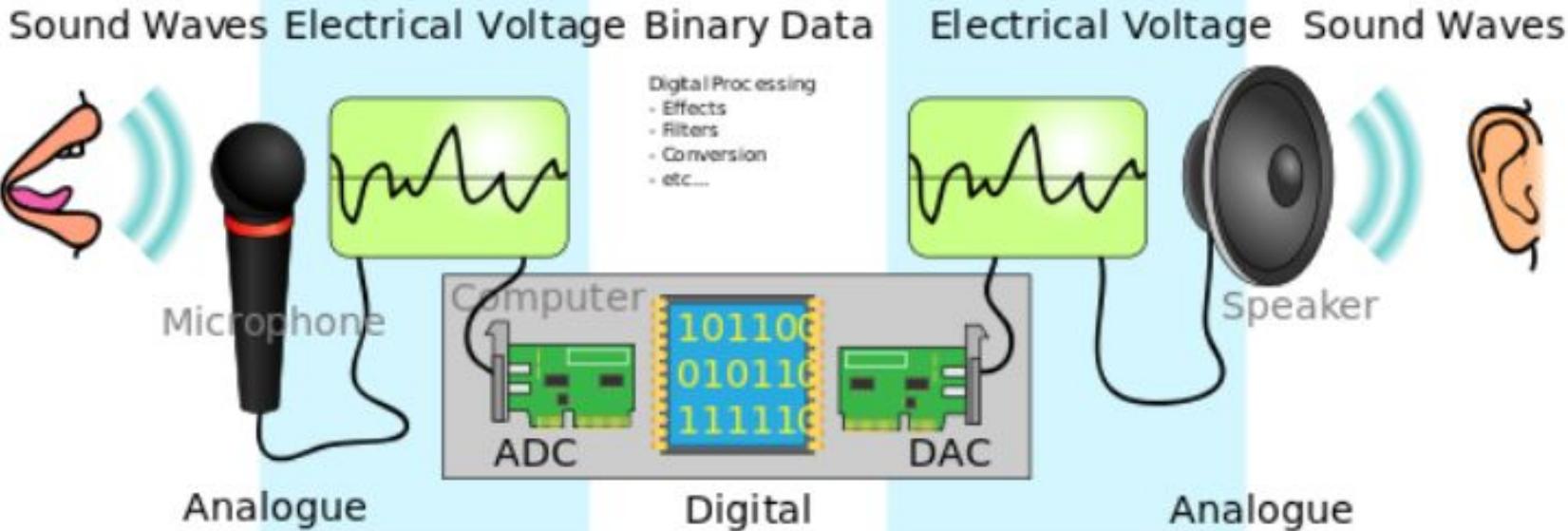


U+1F69F



U+1F63F

Voice Representation



Voice Representation

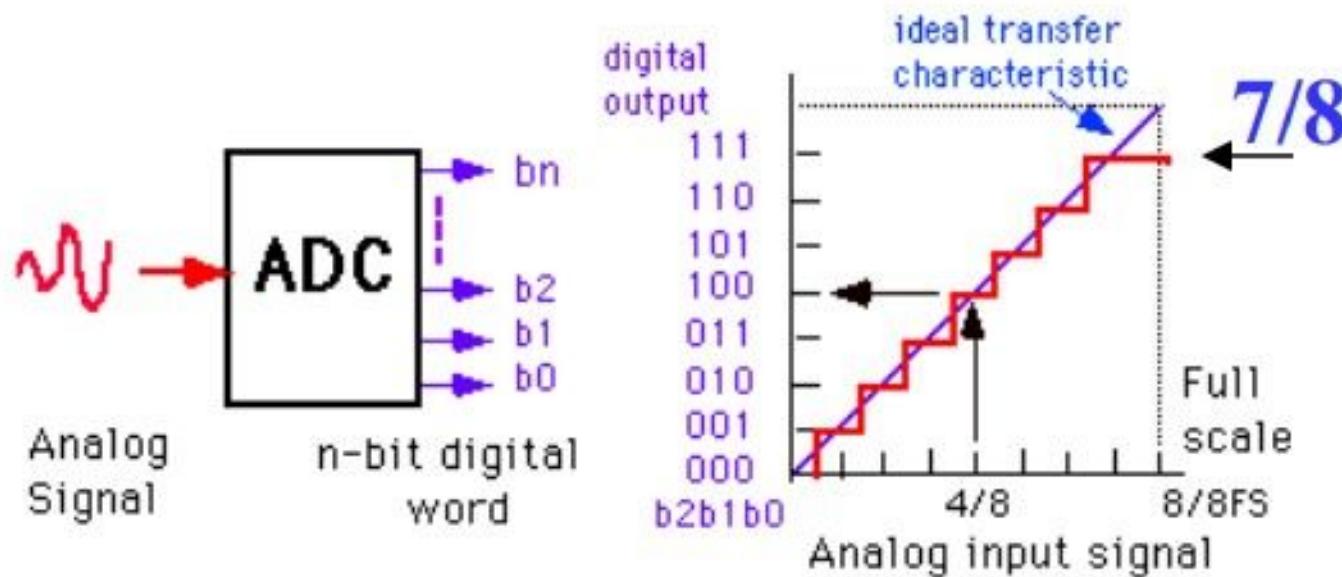


Image and Video Representation

- RGB (Red, Green Blue)

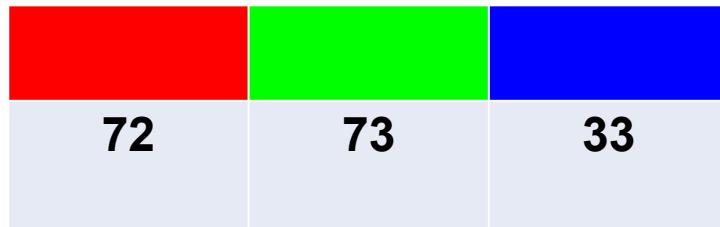


Image and Video Representation

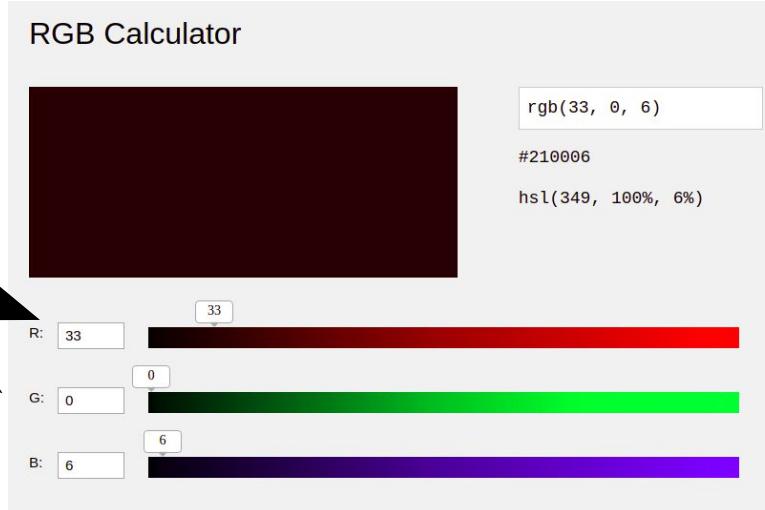


Image and Video Representation

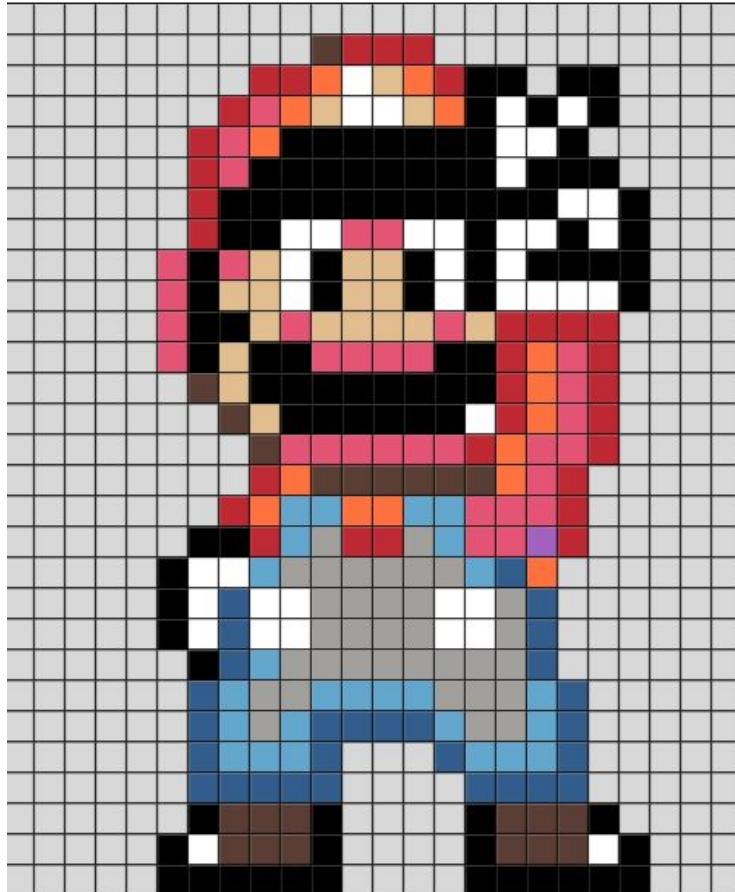
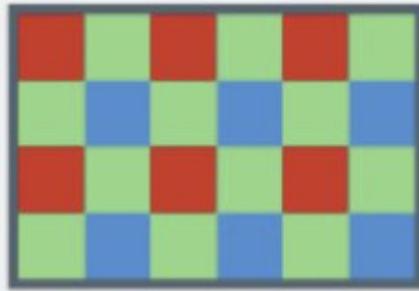


Image and Video Representation



How does 4K compare?

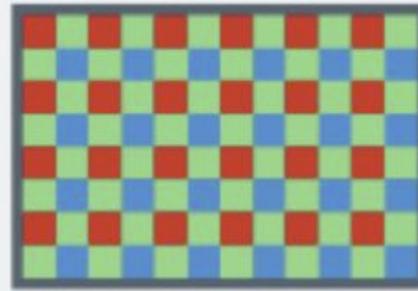
Standard definition (SD)



704 x 576 pixels

405,504
pixels in total

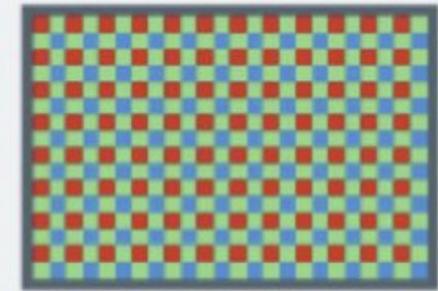
Full HD



1,920 x 1,080 pixels

2,073,600
pixels in total

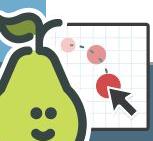
4K UHD



3,840 x 2,160 pixels

8,294,400
pixels in total

How well did you like this section?



Students, drag the icon!



Bits and Bytes



Bit

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

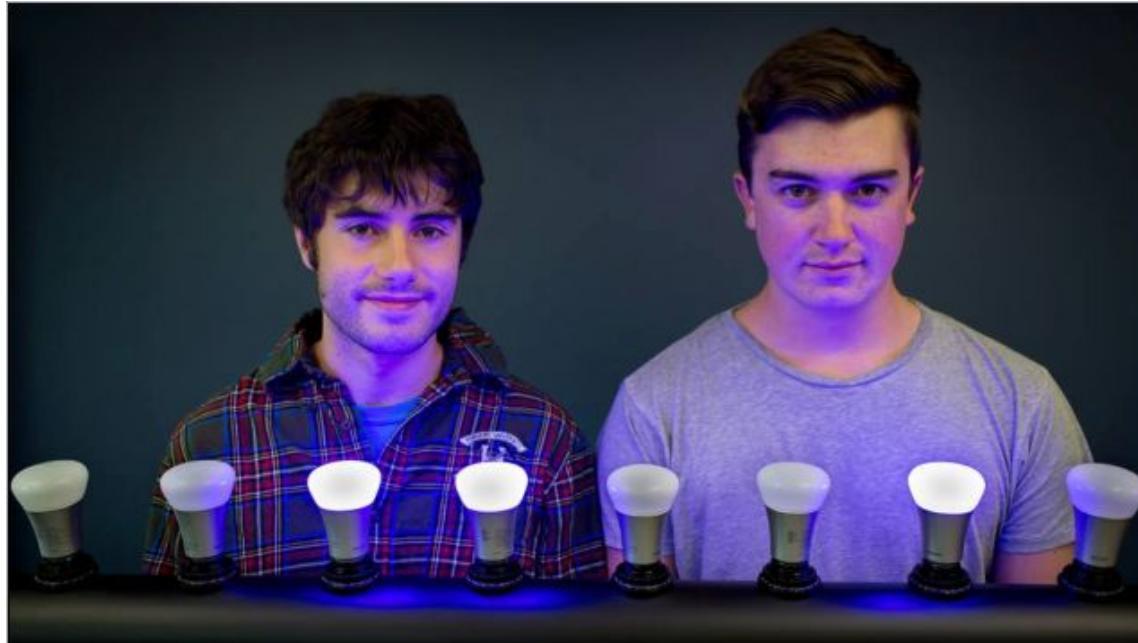


Bits and Bytes



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



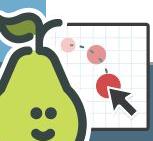
Terabyte

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

Bits and Bytes



How well did you like this section?



Students, drag the icon!





Computer Fundamentals

“Software”

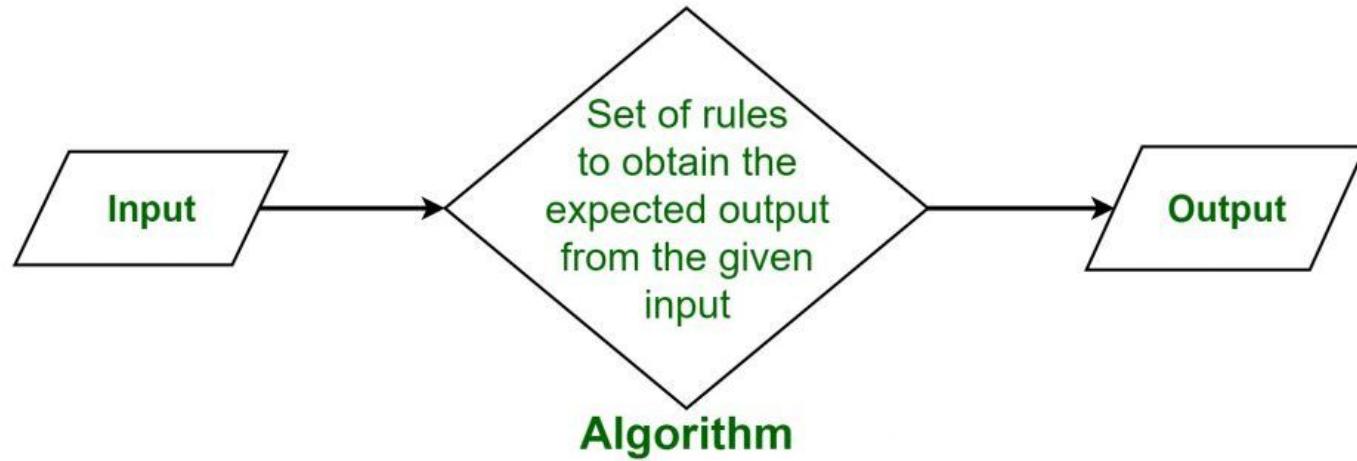




Agenda

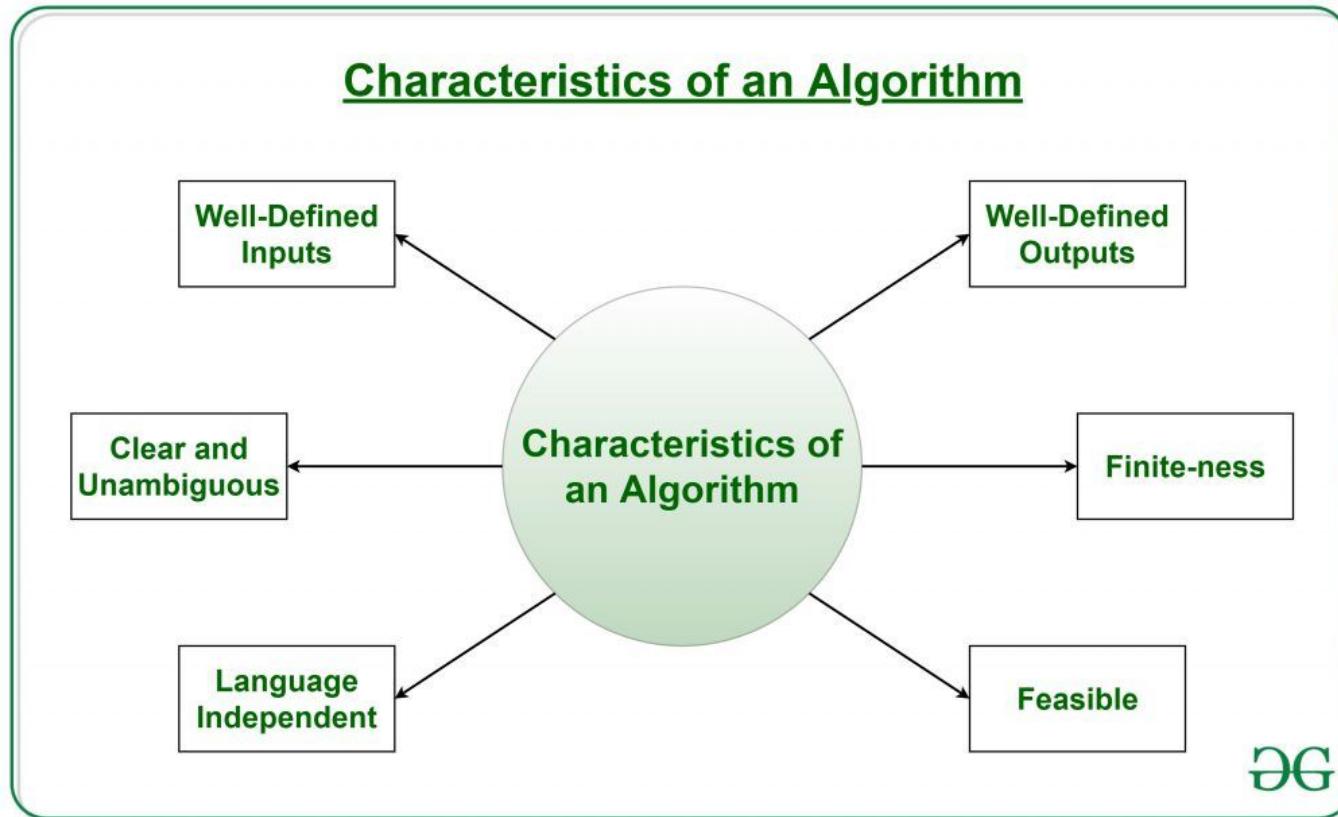
- ▶ What is Algorithm
- ▶ Software
- ▶ Machine Language
- ▶ Assembly Language
- ▶ High Level Languages
- ▶ Libraries/Packages/Frameworks
- ▶ Backend/Frontend

What is Algorithm





What is Algorithm



DG



Software

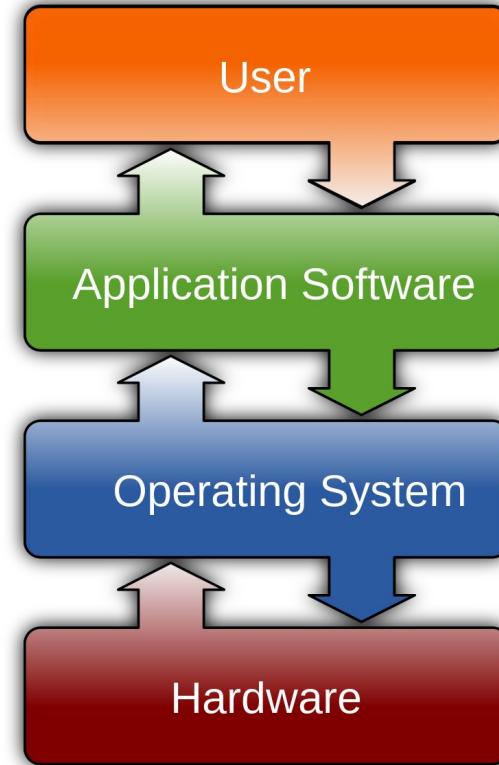
Software ?

➤ Software

Computer Instructions or data, anything that can be stored electronically is **Software**.

➤ Examples:-

➤ Ms word, excel, power point, spread sheets, library management system etc.



Software



Have you heard of any of Programming Languages?

Yes

No



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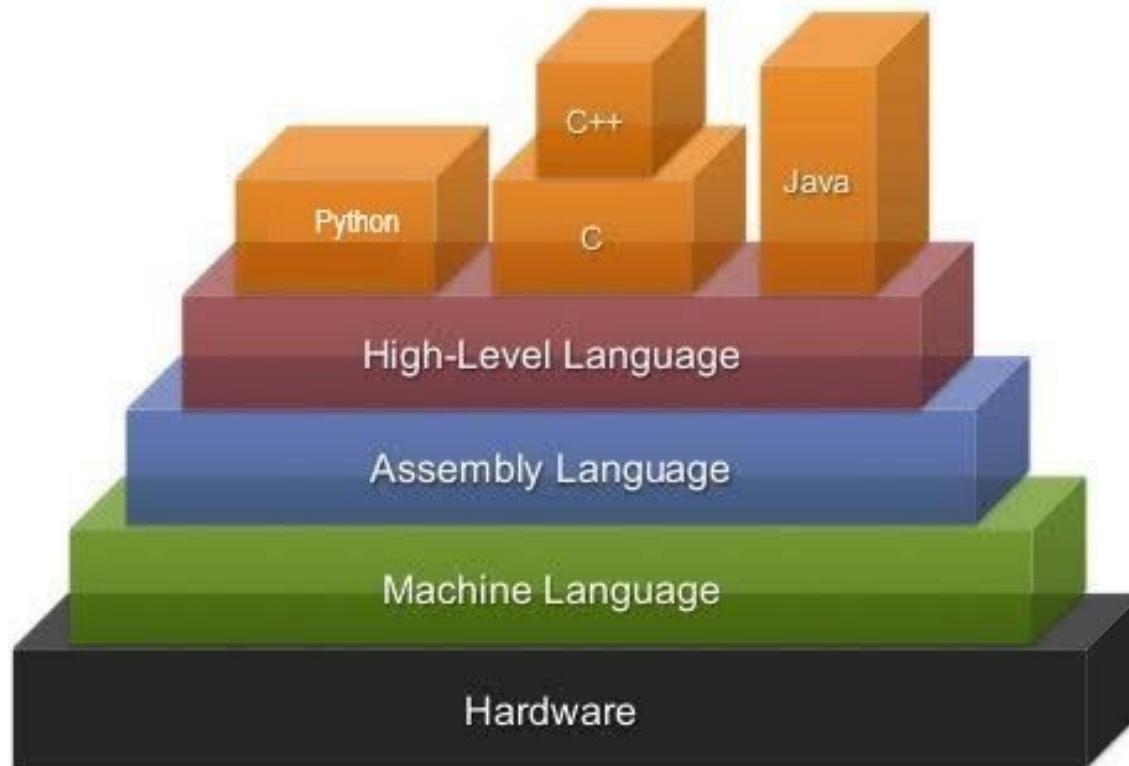


Students choose an option

REINVENT YOURSELF



Software





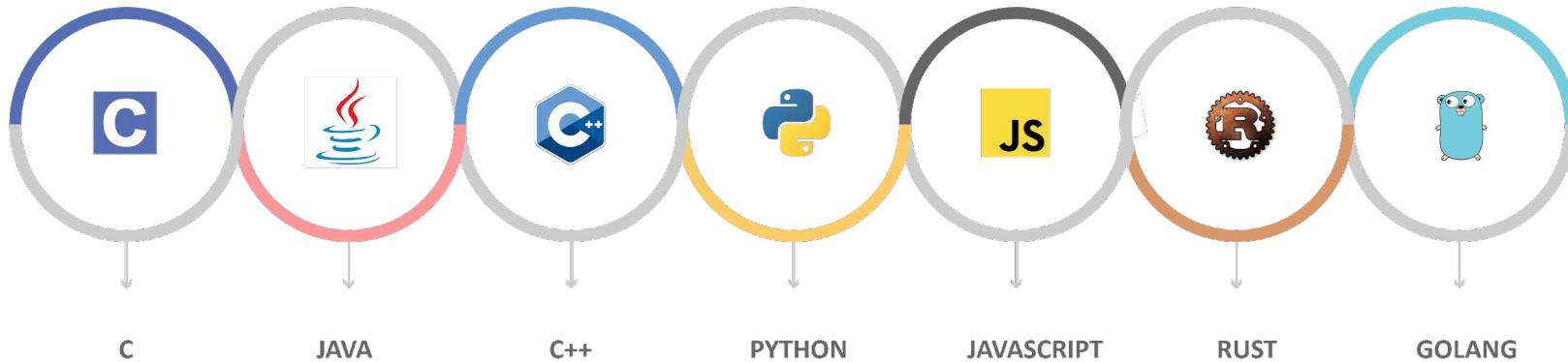
Low Level Languages:

- Assembly Language
- Machine Language

Software



High Level Languages:



Software



High Level Language	Low Level Language
These are Interpreted	Direct memory management
They have open classes and message-style methods which are known as Dynamic constructs	Hardware has extremely little abstraction which is actually close to having none.
Poor performance	Much faster than high level
Codes are Concise	Statements correspond directly to clock cycles
Flexible syntax and easy to read	Superb performance but hard to write
Is object oriented and functional	Few support and hard to learn
Large community	

What does highlevel/ lowlevel mean?



Students, write your response!

REINVENT YOURSELF

Pear Deck Interactive Slide
Do not remove this bar

Machine Language

Example of machine-language

Here's what a program-fragment looks like:

```
10100001 10111100 10010011 00000100  
00001000 00000011 00000101 11000000  
10010011 00000100 00001000 10100011  
11000000 10010100 00000100 00001000
```

It means: $z = x + y;$

Assembly Language

```
// I·15;  
MOV R3, #15  
STR R3, [R11, #-8]  
  
// J·25;  
MOV R3, #25  
STR R3, [R11, #-12]  
  
// I·I·J;  
LDR R2, [R11, #-8]  
LDR R3, [R11, #-12]  
ADD R3, R2, R3  
STR R3, [R11, #-8]
```

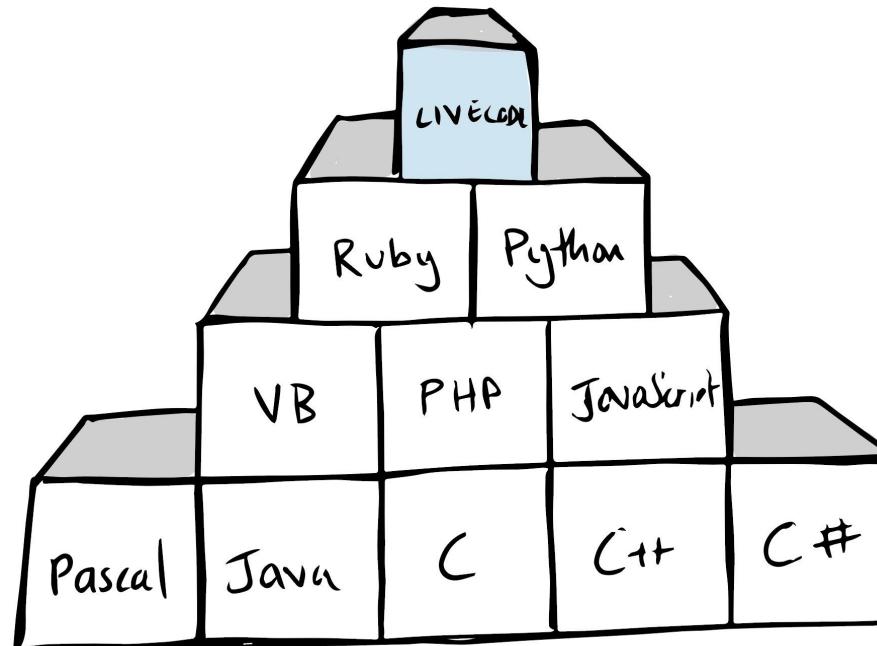
ASSEMBLY LANGUAGE

```
101010101010  
1010101010101010  
1010101010101010  
1010101010101010  
1010101010101010  
1010101010101010  
1010101010101010  
1010101010101010  
1010101010101010  
1010101010101010  
1010101010101010  
1010101010101010  
1010101010101010  
1010101010101010  
1010101010101010  
1010101010101010
```

MACHINE CODE



High Level Languages





High Level Languages

Source Code:

Source code is a
human-readable text written
in a specific programming
language.

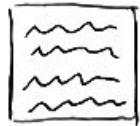
```
40
41 $(function(){cards();});
42 $(window).on('resize', function(){cards();});
43 function cards(){
44   var width = $(window).width();
45   if(width < 750){
46     cardssmallscreen();
47   } else{
48     cardsbigscreen();
49   }
50 }
51 function cardssmallscreen(){
52   var cards = $('.card');
53   height = 0;
54   card2 = 2;
55   for(i=0;i<cards.length;i++){
56     cards[i].style.height = height + 'px';
57     height += 20;
58   }
59 }
```



High Level Languages

Source code:

hello.c



→ COMPILER →

Machine code:

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

Program (also
called binary,
executable ...)

run the
program

→ result



Source code:

hello.py



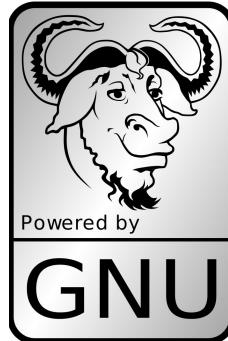
→ INTERPRETER → result



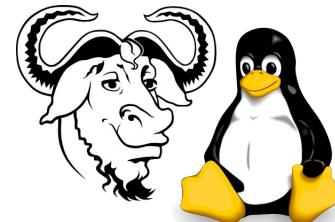
High Level Languages



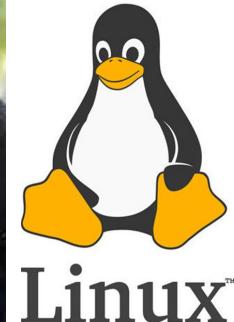
Free Software vs. Open Source Software



Richard Stallman



Linus Torvalds



High Level Languages

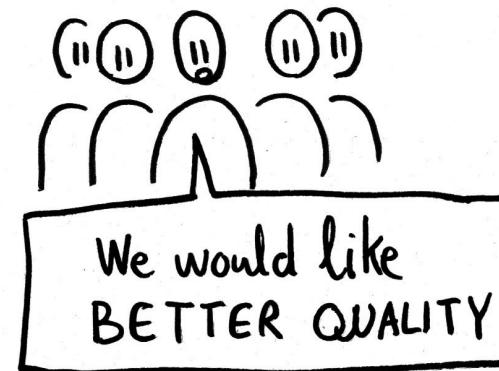


Free software
activists

Open source
boosters



ethical
approach



technical
approach



High Level Languages

Bug:

- Story: named after a moth
- Two types: syntax and logic errors
 - prnt("I could forgotten something.")



Photo # NH 96566-KN (Color) First Computer "Bug", 1947

92
9/9
0800 Antran started
1000 stopped - antran ✓
13°v6 (033) MP-MC 1.13047645 (02) 4.615925059 (-)
033 PRO 2 2.13047645
conck 2.13047645
Relays 6-2 in 033 failed special speed test
in relay 11.000 test.
Relays changed
1100 Started Cosine Tape (Sine check)
1525 Started Multi Adder Test.
1545 Relay #70 Panel F
(moth) in relay.
First actual case of bug being found.
1630 Antran started.
1700 closed down.

Falling 214.5
Rising 337.1

High Level Languages

```
print("Clarusway Rocks")
```

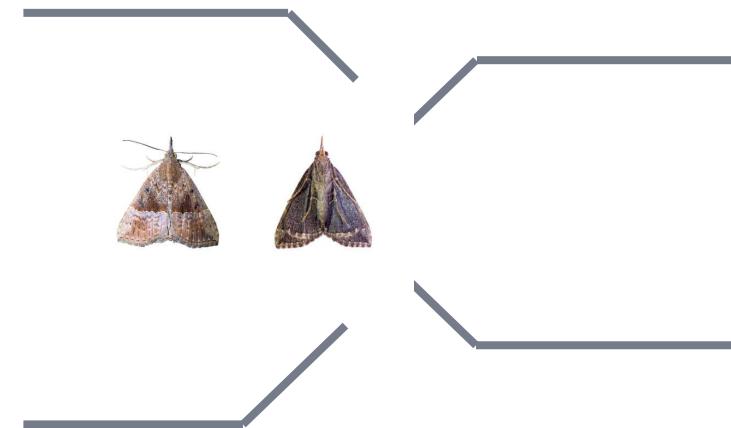
Find bugs and write the correct ones to right hand side:

Instructions

```
print(5, 7);
```

```
prnt(1, 2);
```

```
print("hello world");
```



Students, draw anywhere on this slide!

In one minute,
write the most
important thing from
Software's
topic.



Students, write your response!

REINVENT YOURSELF

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Do not remove this bar



Circle how you are feeling:



Pear Deck



Students, draw anywhere on this slide!

REINVENT YOURSELF

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Do not remove this bar



Kahoot!



THANKS!

Any questions?

