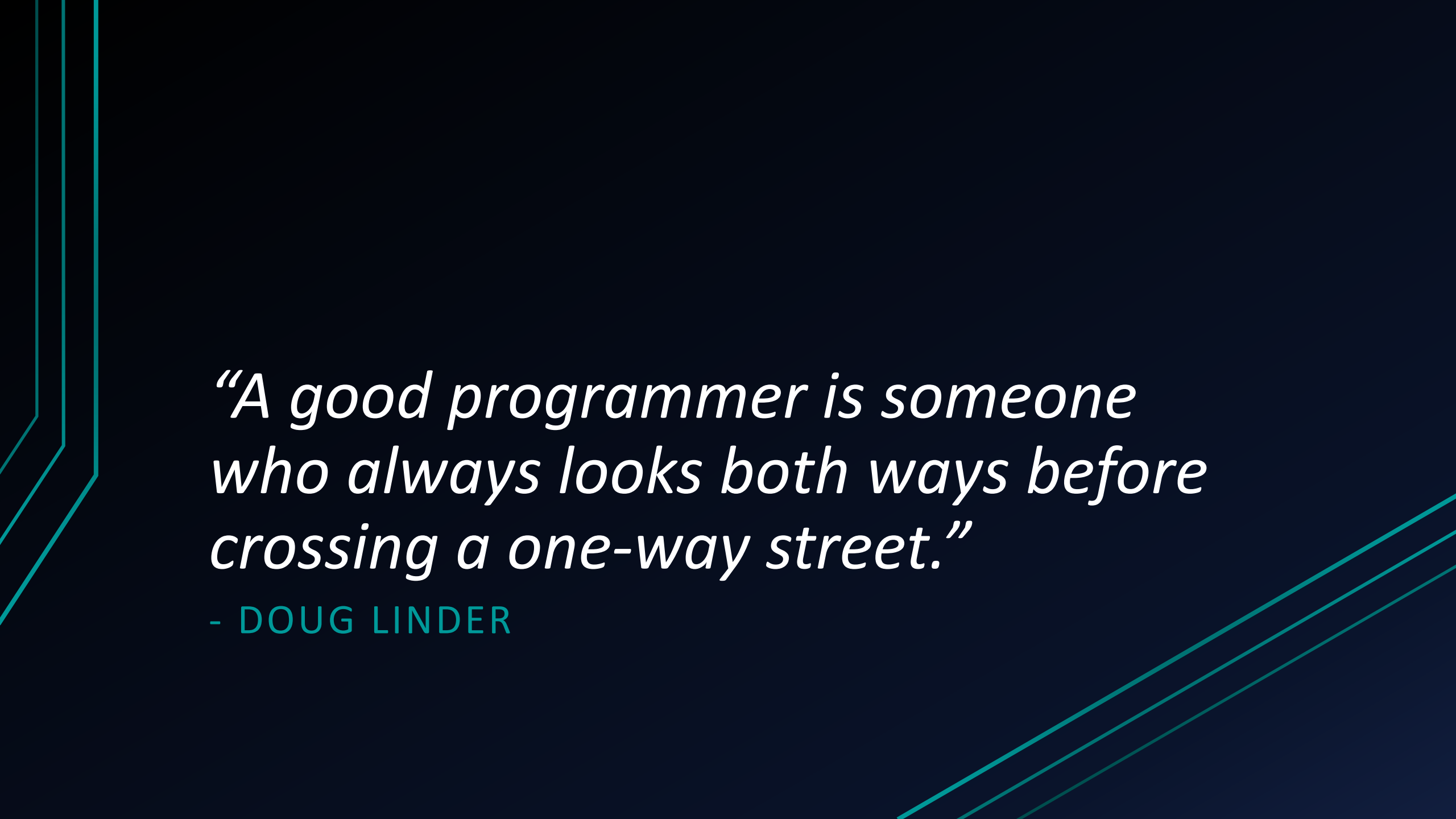




CSI-120 Week 1

LECTURE NOTES



*“A good programmer is someone
who always looks both ways before
crossing a one-way street.”*

- DOUG LINDER

What is a computer?



Melba Roy led the group of human computers who tracked the Echo satellites in the 1960s. (NASA)

Introduction to Computers

The first computers were humans that were hired to perform complex computations by hand.

The term computers did not apply to machines until the 1950s.

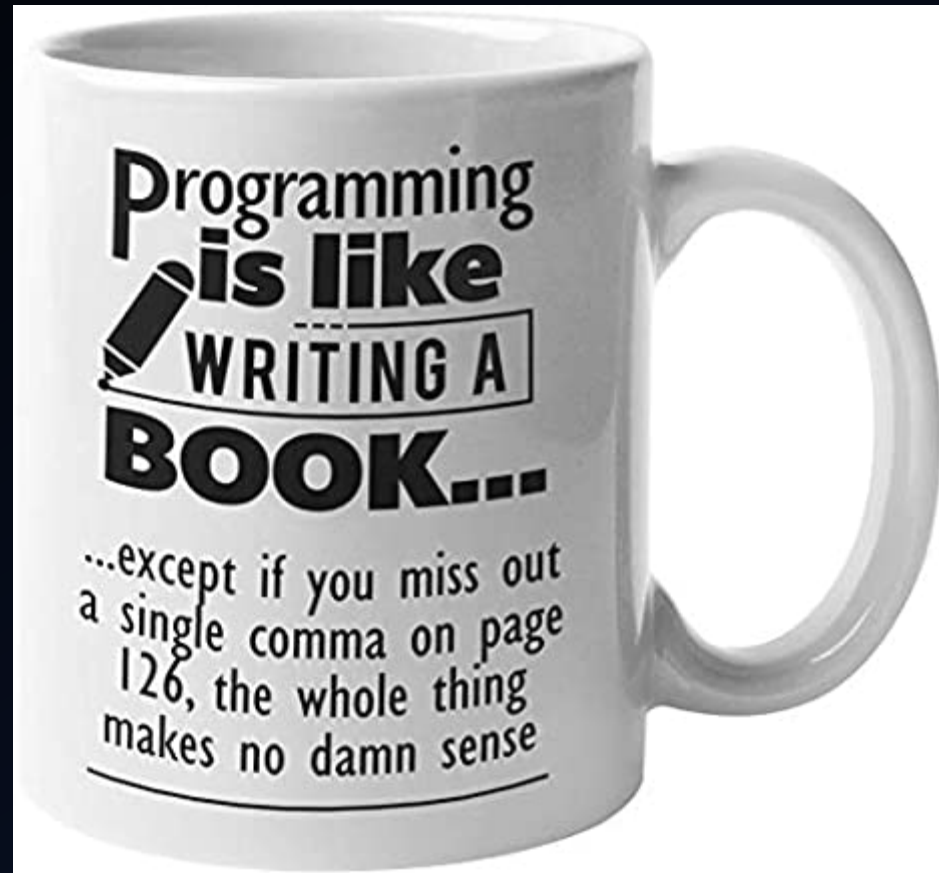
These early computers took up an entire room.

What we think of as a computer today was originally known as a Personal Computer.

Personal Computers came about in the 1970s but did not become commonplace until the 1980s and 1990s.

CSIRAC – 1949 (1mhz, 2kb ram)





Computers Execute Instructions

Despite how they seem, Computers are not intelligent.

All computers do is execute instructions that they are given.

A computer program is simply just a set of instructions.

A sample computer program may look something like this:

- Get input from a file (or a user, or the internet)
- Run computations on the input (calculate the average of a group of numbers)
- Output the average (to a monitor, to a file, to the internet)

Programming is writing instructions

- A program is like a recipe that the computer will follow.
- Recipes are a set of instructions that must be followed to get the expected result.
- A sequence of instructions to solve a problem is called an **ALGORITHM**.

Bake A Cake

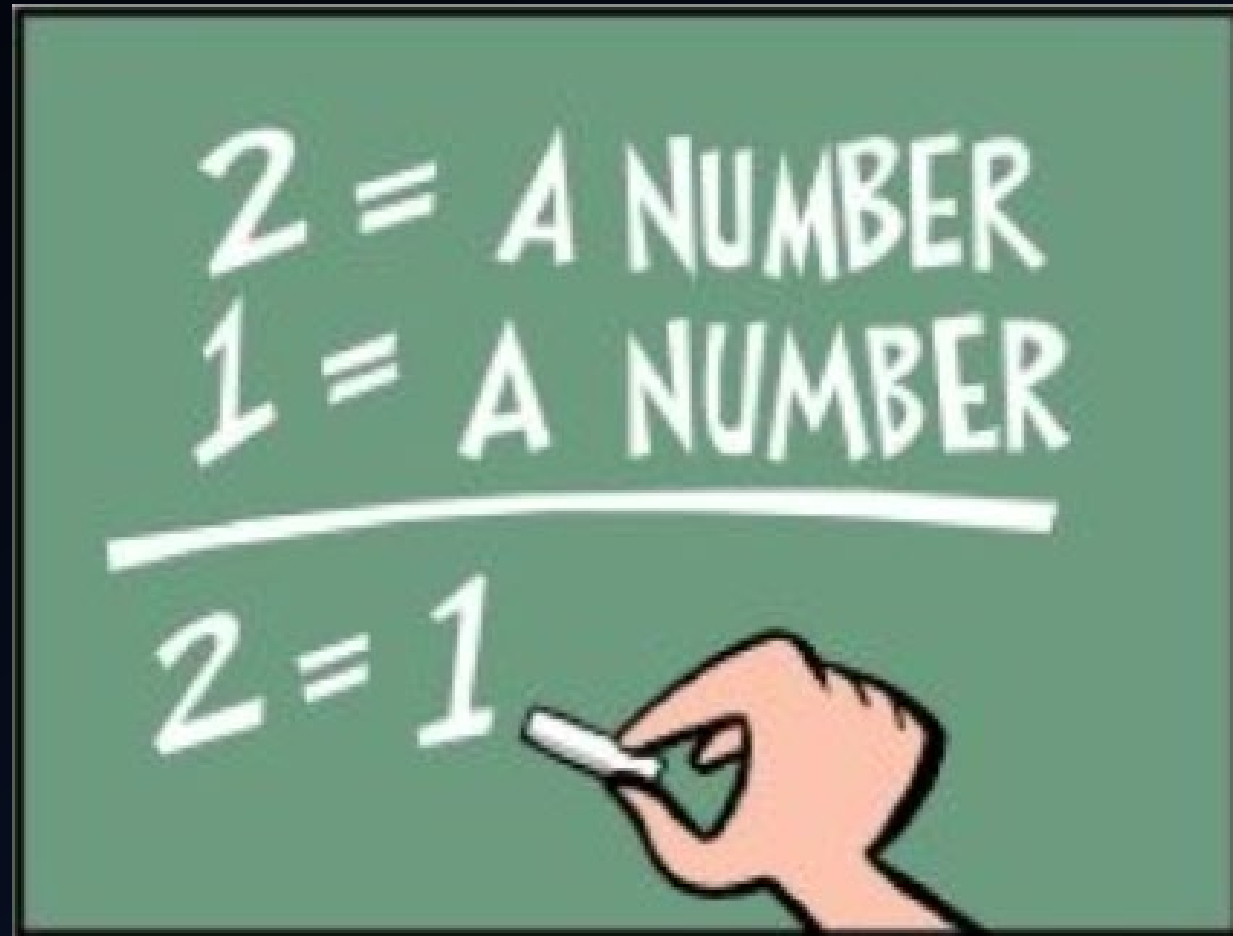
Ingredients: ½ cup butter, 1 cup sugar, 2 egg, 2 cups flour

Mix butter sugar and egg in a mixing bowl

Stir in flour

Bake at 350 degrees for 30 minutes

Errors



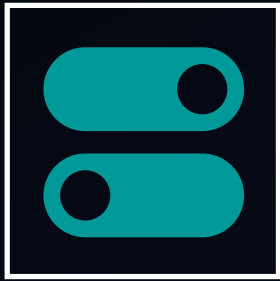
Logic Error

- If you followed a recipe for a cake that listed salt instead of sugar the output of the recipe would not be correct even though you followed the recipe perfectly.
- This is what is known in programming as a logic error, the cake came out of the oven however it was not what was expected.
- **LOGIC ERROR**– A mistake where the program works but the output is not correct, for example multiplying two numbers when they should have been added.

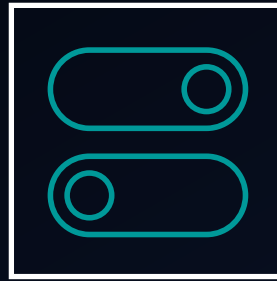
Syntax Error

- If the cake recipe had an instruction that was spelled wrong (fluor instead of flour). The computer would go looking for fluor and not be able to find any. This is known as a **SYNTAX ERROR**.
- **SYNTAX ERROR** – A mistake that breaks a rule of the programming language typically preventing the program from running. For example, forgetting a semicolon at the end of a line.

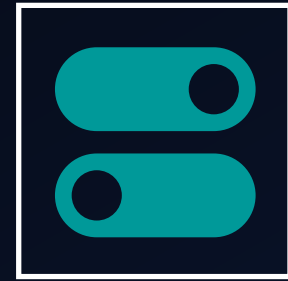
Switches (How the instructions are stored)



Computers are made up of Switches
like a light switch



The computer can store information
based on a collection of switches
being either ON (1) or OFF (0)



To store the number 1, the computer
changes one switch to ON

Binary Digits (bits)



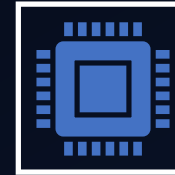
A bit is the smallest unit of data a computer can store.



A bit can have two possible values 0 or 1.



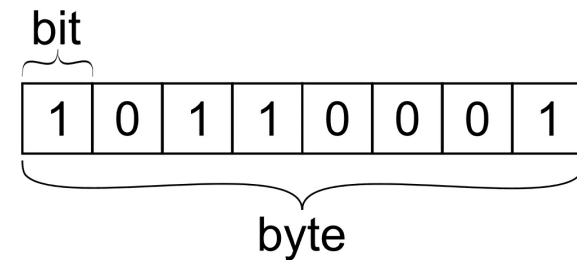
Multiple bits are required to store more complex values.



A circuit is a collection of switches each storing 1 bit of data that are used to store larger values.

Bits and Bytes

- 8 **BITS** is known as a **BYTE**.
- 1024 **BYTES** is a **KILOBYTE**.
- 1024 **KILOBYTES** is a **MEGABYTE**.
- 1024 **MEGABYTES** is a **GIGABYTE**.
- 1024 **GIGABYTES** is a **TERABYTE**.



Numbers in Binary

- Since a computer can only store 0s and 1s a system had to be created to store a number with a larger value.
- **BINARY** is a 2 based numbering system. What we are used to is a 10 based numbering system.

decimals								
whole numbers					decimal fractions			
Thousands	Hundreds	Tens	Ones	Decimal Point	Tenths	Hundredths	Thousandths	Ten-thousandths
6	9	4	5	.	3	7	2	8

Each place is 10 times larger than the place to its right.

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place value in the binary system is based on 2					
2^5	2^4	2^3	2^2	2^1	2^0
32's	16's	8's	4's	2's	1's
thirty-twos	sixteens	eights	fours	twos	ones
		1	1	0	0

= 12

a Base-2 system

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Coding in 1s and 0s

Originally programmers had to create programs using only 1s and 0s. This was known as **MACHINE LANGUAGE**.

As programming evolved **HIGH-LEVEL LANGUAGES** were created. The languages allowed programmers to use code that was more easily readable by humans.

For high-level language code to be read by a computer it must be converted into 1s and 0s by a **COMPILER**.

The high-level language we will be using in this course is **C#**

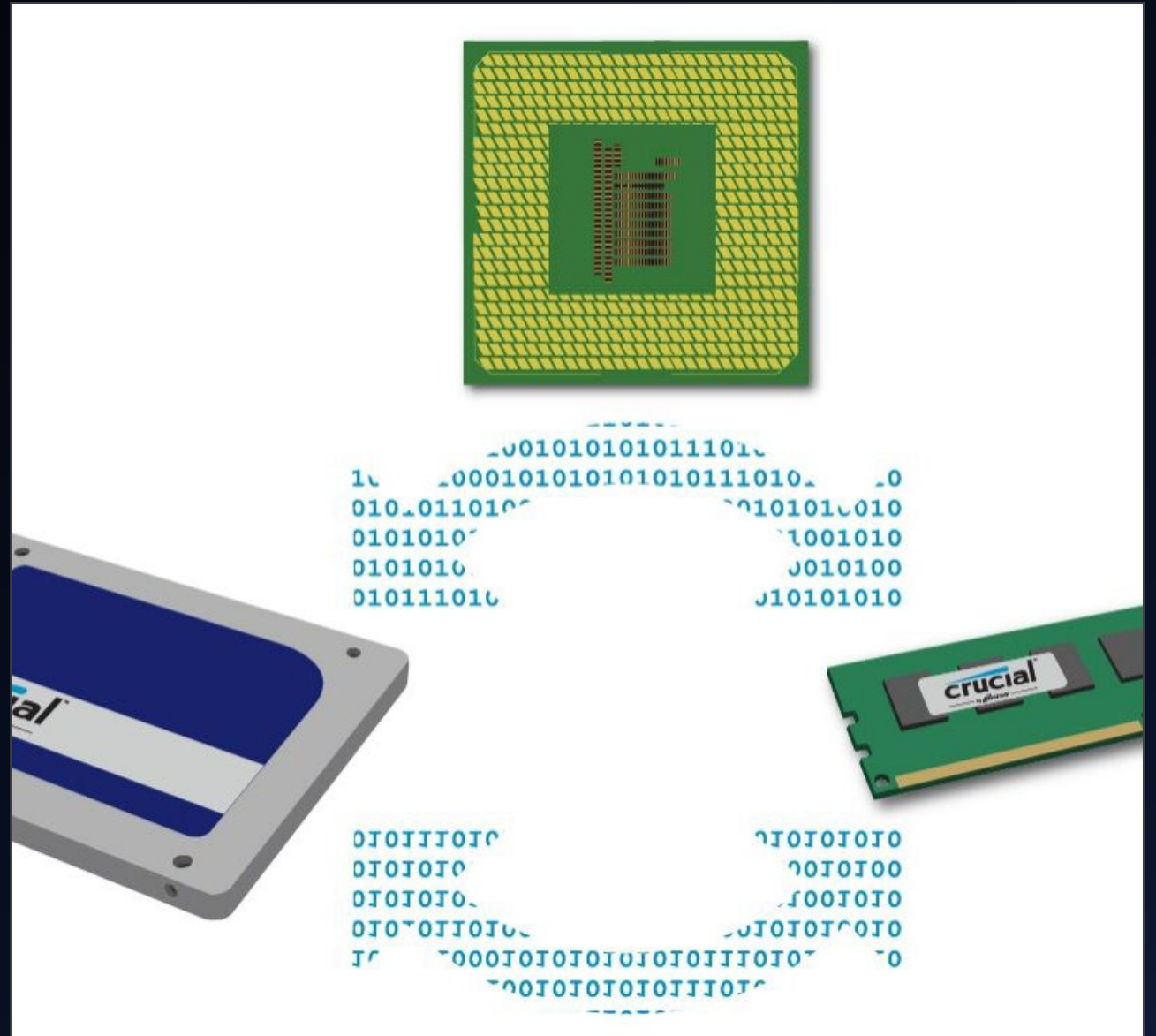
MODERN COMPUTER COMPONENTS

While computers today are made up of many different components there are 3 that we are going to talk about today

Processor

Memory

Storage



Processor (CPU, The brain)

- The **PROCESSOR** is the part of the computer which does the actual computations.
- In the recipe example the processor would be thought of as the baker of the cake.
- The processor can only work on information stored in the **MEMORY**.
- The #1 factor of how quickly the computer can do work is the processor.

Memory (Ram)

- **MEMORY** or **RAM** is a collection of circuits used to store information that is ready for processing.
- Despite its name, **MEMORY IS TEMPORARY STORAGE.**
- Using our cake example:
 - The recipe and the ingredients would be stored in memory. Once the cake was done, the information related to the cake would be removed from memory.

Storage (Hard drive, Flash Drive)

- **STORAGE** is a permanent location for information.
- Before that information can be acted on by the processor it must be moved from permanent storage into memory.
- It is important to understand the difference between a hard drive (Storage) and ram (Memory)
- Memory is temporary and information that is ready to be processed, once processing is complete the information will be removed from memory
- Storage is permanent and cannot be accessed directly by the processor. It must first be loaded into memory.