



Microprocessors

COE 381

WEEK 1: INTRODUCTION
(Contd.)

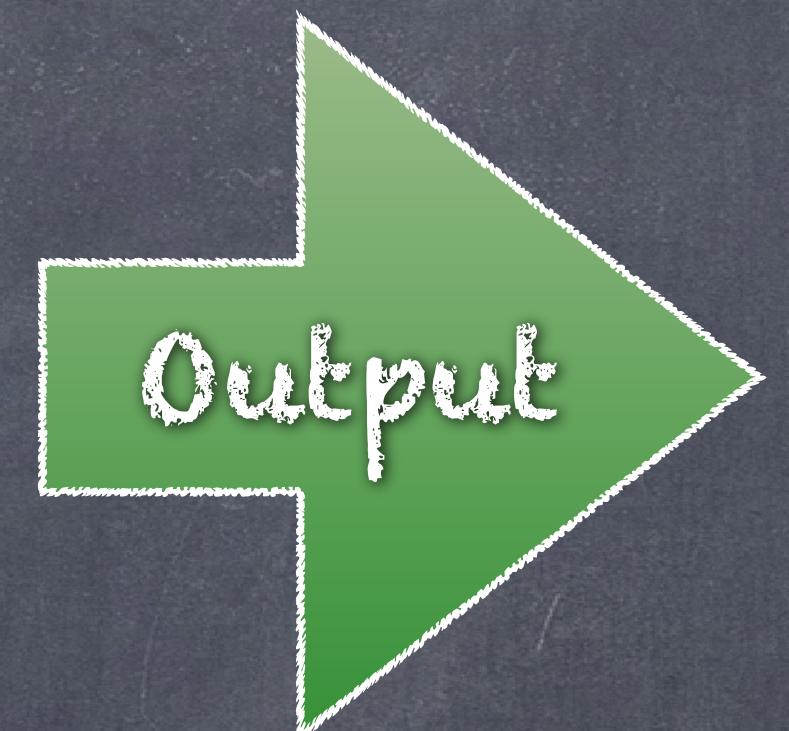
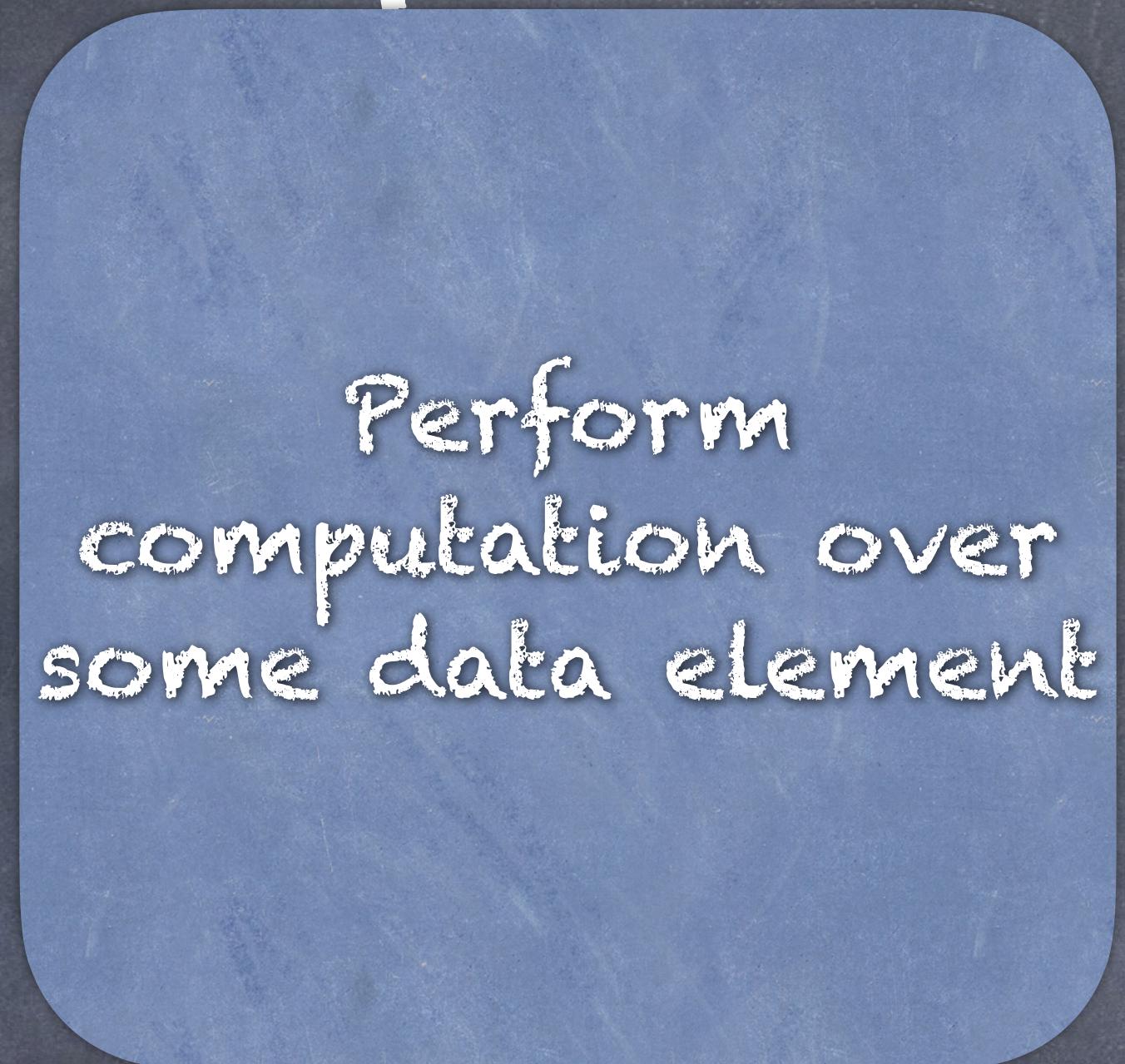
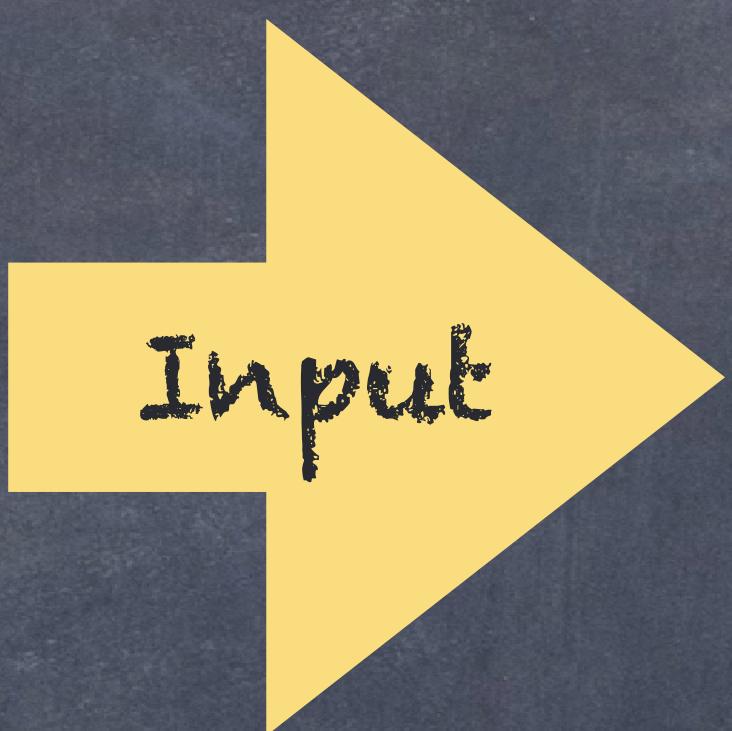


Microprocessors & Microcontrollers



Recap

MP/MC



The data element is represented inside the system in a particular fashion.



Recap

The data element is represented inside the system in a particular fashion.

Representation of Numbers



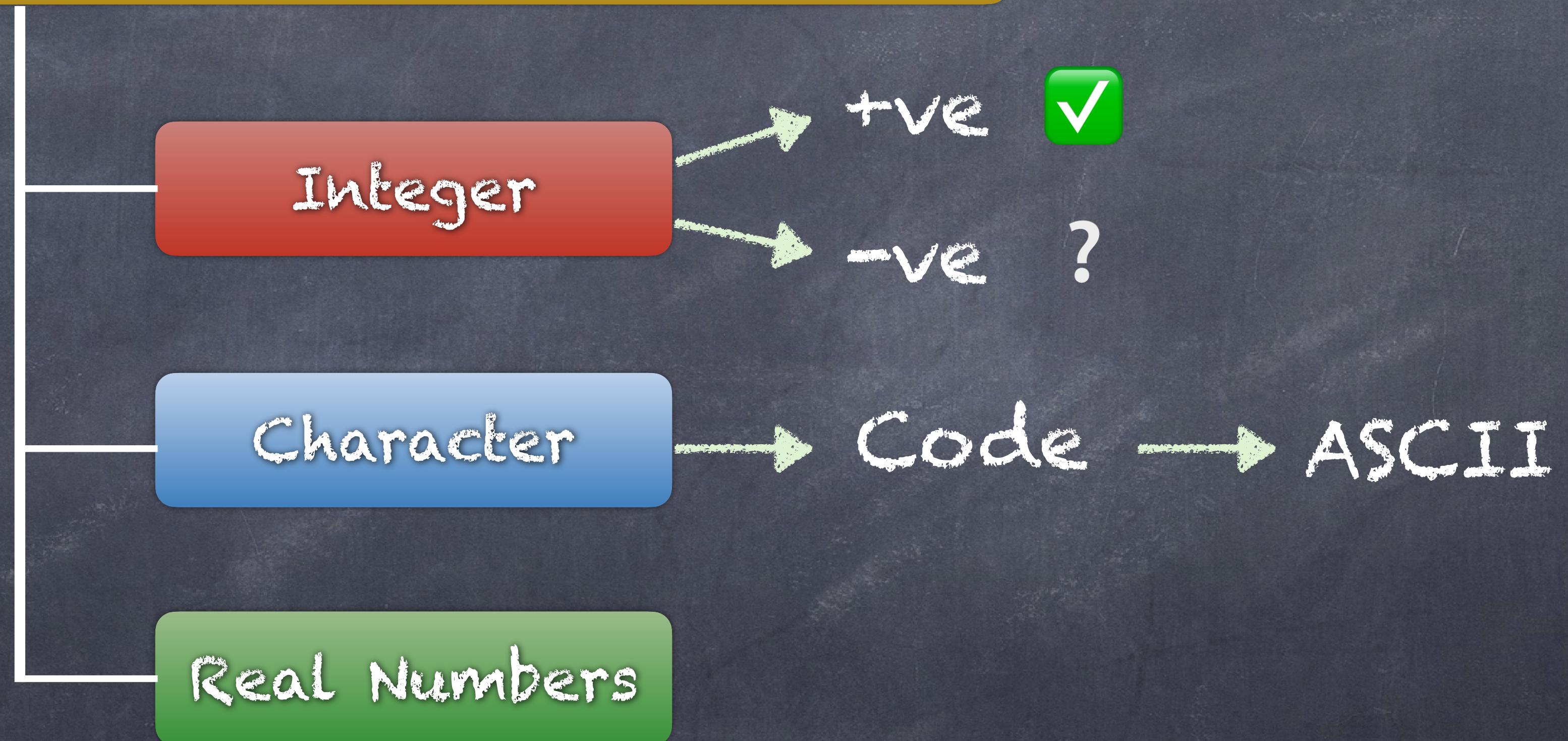
Number System Representation

Fundamental



Recap

Number System Representation





Reading Assignment



Quiz 1

1. State 5 differences between a microprocessor and a microcontroller.
2. Convert 2.75_{10} to binary.

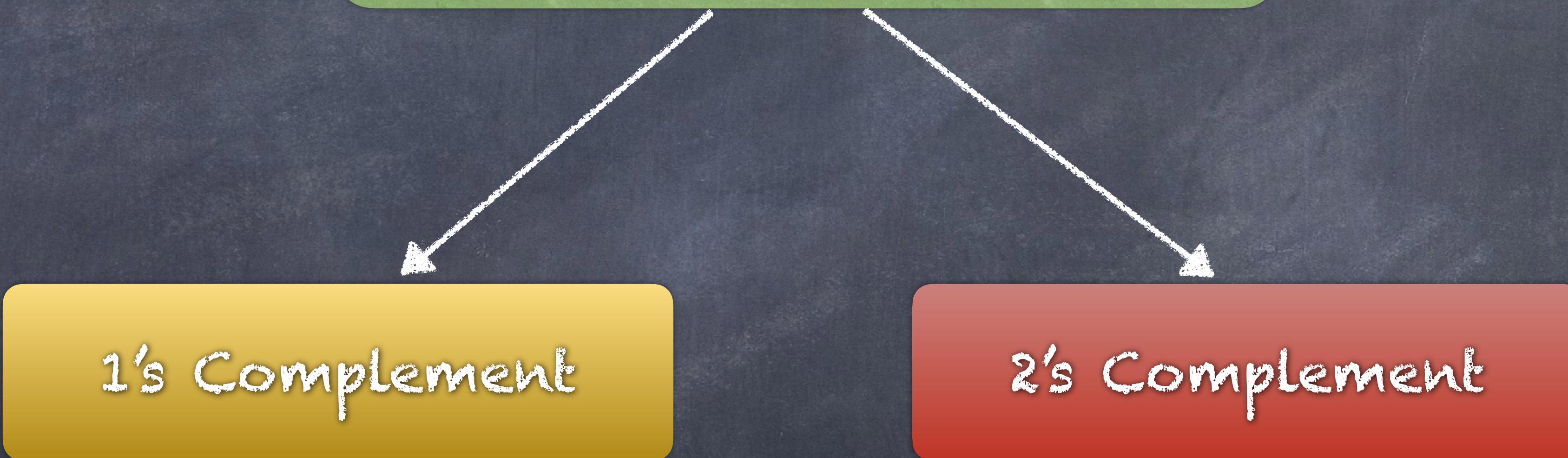


Representation of Negative Numbers



Introduction (Contd.)

Representation of -ve
Numbers





Introduction (Contd.)

1's Complement

In 1's complement representation, the complement of each of the bits represent a negative number.

Example:

Represent the number -4 in a 4-bit number system.



Introduction (Contd.)

1's Complement

The problem with the 1's complement representation.

1. Same representation for different numbers.
2. Different representations for the same number.



Introduction (Contd.)

2's Complement

How does 2's complement address the issues with the 1's complement representation?

NB: The 2's complement can represent

$$-2^{n-1} \rightarrow 2^{n-1} - 1$$

sequence of numbers.



Introduction (Contd.)

Critical Thinking:

How is the following expression executed?

$$55 - 44$$



For processing “represented data”, we need



Digital Logic Circuits



Digital Logic Circuits



TTL
Logic High > 2.4V
Logic Low < 0.5V

CMOS
Logic High
 $0.3 * (VDD - VSS)$



Digital Logic Circuits

Classification of Digital Circuits

Combinational

Sequential

Depends on the current input only.

Depends on the current state + input.

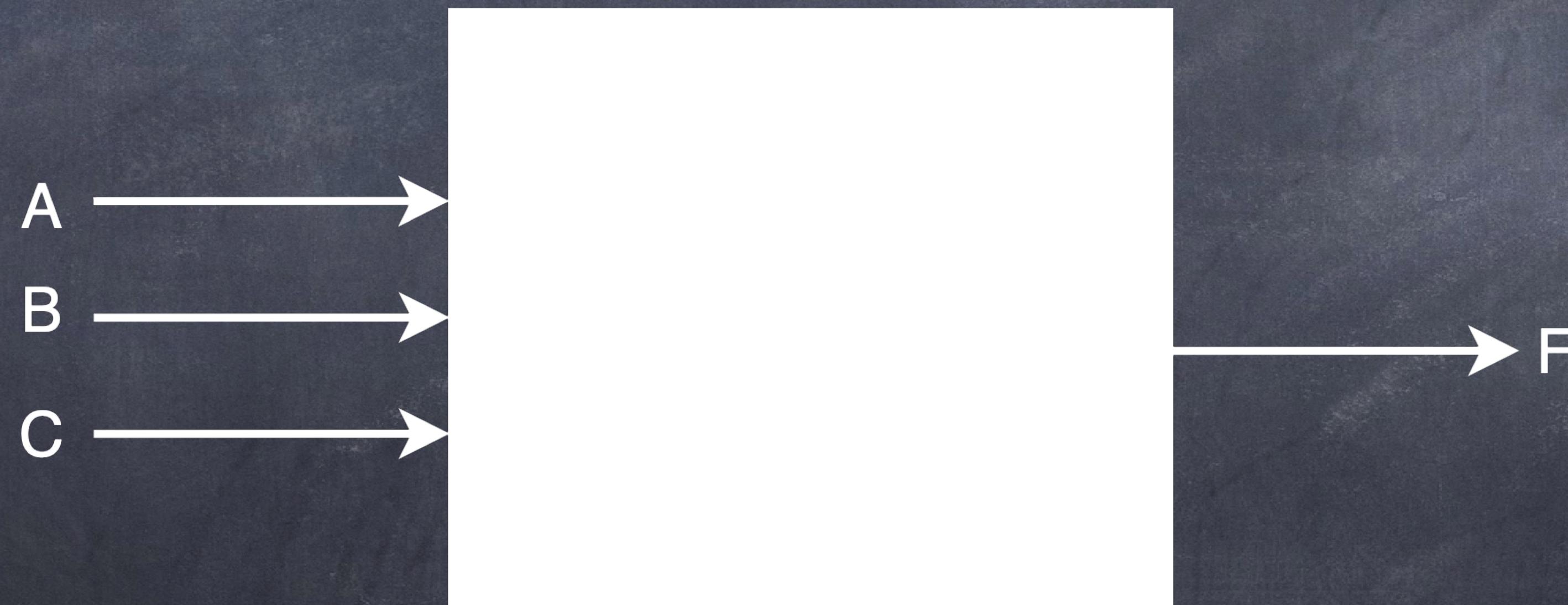
Logic Gates



Digital Logic Circuits

Example:

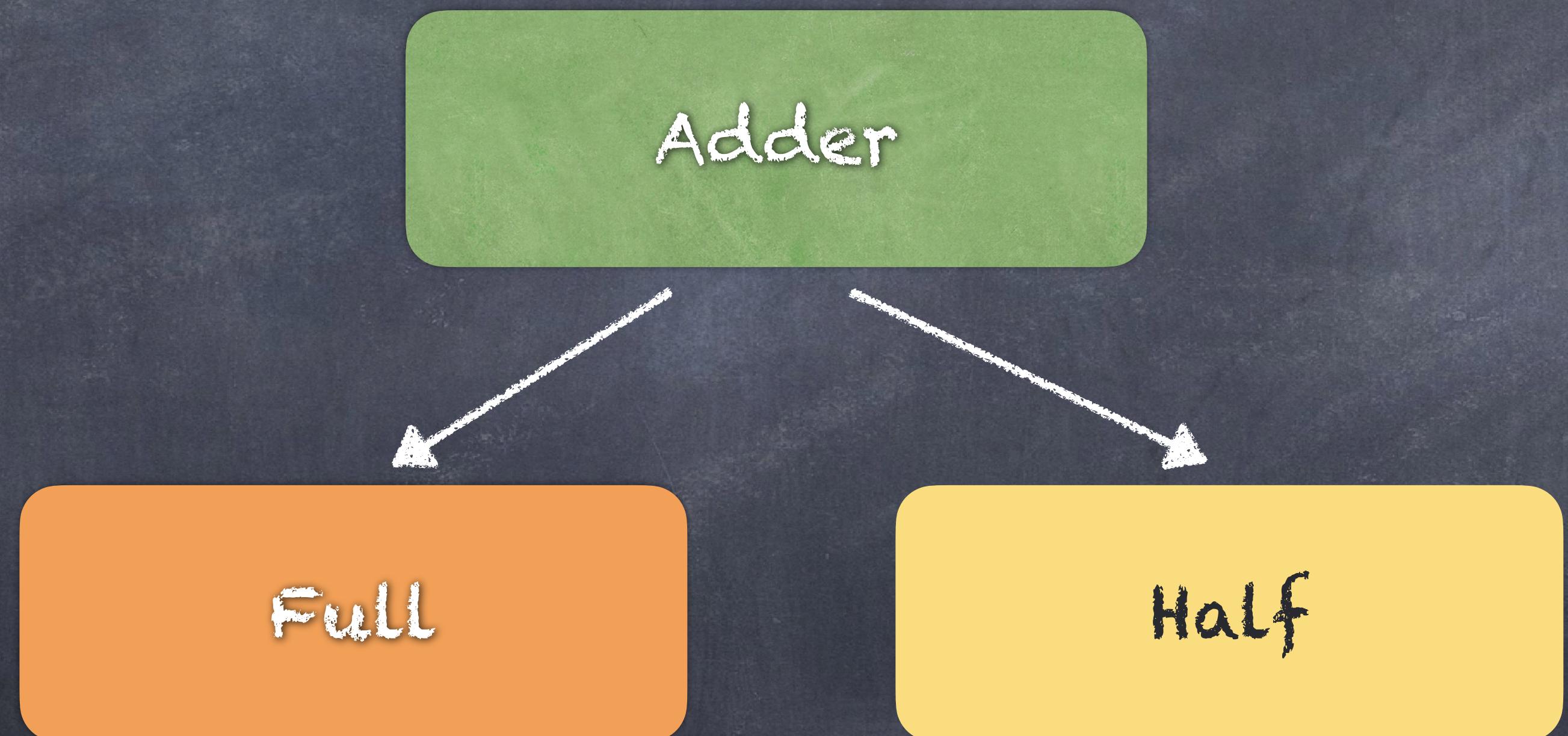
3-input majority gate.





Digital Logic Circuits

One very common circuit used in microprocessors and microcontrollers is the Adder Circuit.



Full

Half



Digital Logic Circuits

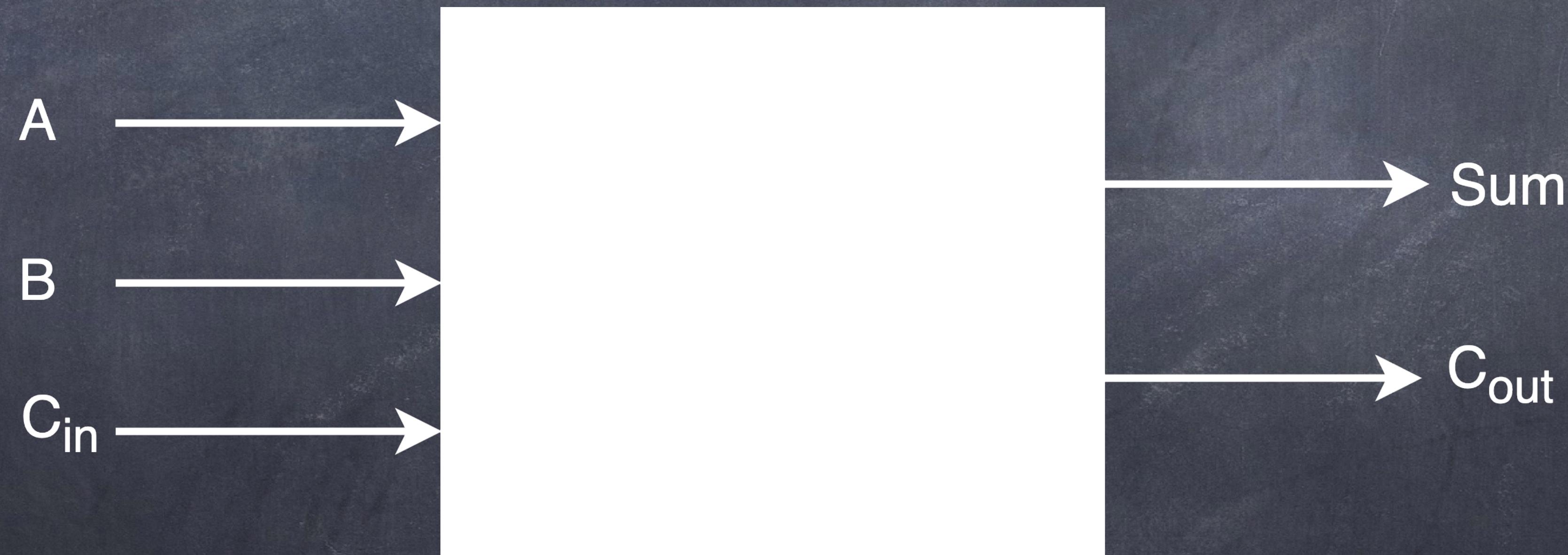
Half Adder





Digital Logic Circuits

Full Adder





Digital Logic Circuits

Sequential Circuits

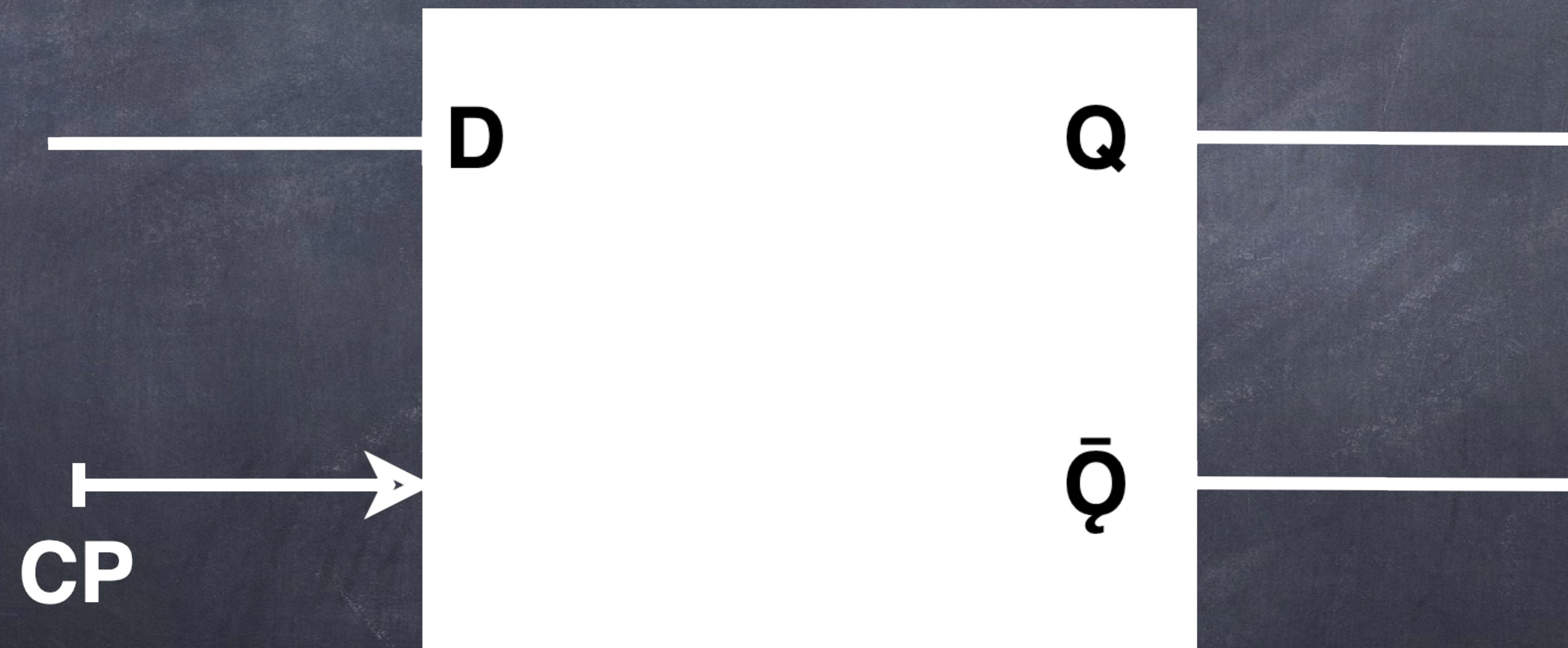
The basic block of any sequential circuit is a flip flop.

It remembers the information about the previous stage of the circuit.



Digital Logic Circuits

Sequential Circuits - D Flip Flop





Digital Logic Circuits

Combinational/Sequential Circuits

Relevance:

1. Comparator.
2. Register.



Next...

Basic Computer Organization