**Combinational circuits:**

A combinational circuit consists of logic gates whose output at any time are determined directly from the values of the present inputs.

Combinational

circuit

inputs outputs

**Design procedure:**

The procedure involves the following steps:

1-Determine the required number of inputs and outputs.

2-Drive the truth table.

3-Obtain the simplified Boolean function for each output.

4-Draw the logic diagram.

**Half adder (H.A.):**

To design a circuit that adds two numbers each of one bit for example:

Two inputs 1 0 1 0

1 + 0 + 0 + 1 +

Two output 1 0 0 1 1

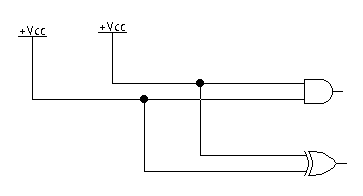
A B C S

0 0 0 0

0 1 0 1 S= A B + A B

1 0 0 1 C= A B

1 1 1 0



S inputs C

A B

output

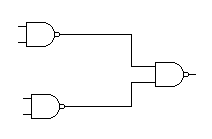
A S

**H.A.** B C

**Using NAND gates only :**

S = A B + A B

S = A B + A B = A B . A B = X . Y

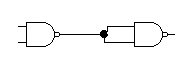


C

S

A B

A B A B

 C= C = A B = A B

**Full adder (F. A):**

في حالة جمع عددين كل واحد مكون من 2-bit أي لتصميم دائرة تجمع ال bits في المرحلة الثانية و ما بعدها:

Ci 1

A 0 1

A S

B F.A.

Ci Co

B 1 1 +

1 0 0

Carry sum