Half Subtractor

1) Definition

A half subtractor computes A - B for single bits A (minuend) and B (subtrahend).
Outputs: D (Difference), Borrow (Bo).

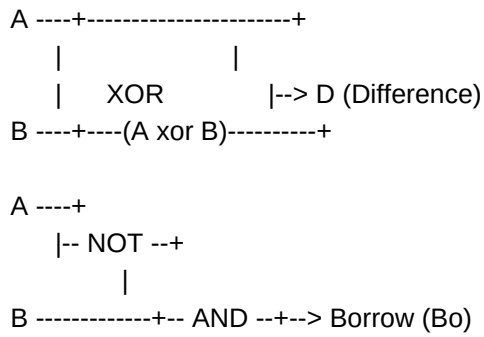
2) Truth table

A	B	D	Borrow
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0

3) Boolean equations

Difference: D = A XOR B
Borrow: Bo = B AND (NOT A) => Bo = B & A'
Alternate: D = A B' + A' B ; Bo = B A'

4) Gate-level circuit (ASCII diagram)



5) Block diagram

Inputs: A, B ---> [Half Subtractor] ---> Outputs: D, Borrow

6) Examples

A=1, B=0 -> D=1, Borrow=0
A=0, B=1 -> D=1, Borrow=1
A=1, B=1 -> D=0, Borrow=0