Board 1 :

1Y : - ( a ^ b ) = -cout

2Y : - ( -b ^ a )

3Y : nand ( -( -b ^ a ) ^ -( b ^ -a ) ) = sum;

4Y : - ( b ^ -a )

Board 2 :

1Y : nand(c , nand(c , sum))

2Y : nand(nand(c , nand(c , sum)) , nand(sum , nand(c , sum)))

3Y : nand(sum , nand(c , sum))

4Y : nand(c , sum)

SUM :

( sum ^ c' ) v (sum ^ sum' ) v (sum' ^ c) v (c ^ c' )

( sum ^ ( c' v sum' ) ) v ( c ^ ( sum' v c' ) )

- ( -( sum ^ -( c ^ sum ) ) ^ -( c ^ -( sum ^ c ) ) )

- ( -( sum ^ nand(c , sum) ) ^ -( c ^ nand(c , sum) ) )

- ( nand( sum , nand(c , sum) ) ^ nand( c , nand(c , sum) ) )

nand ( nand( sum , nand(c , sum) ) , nand( c , nand(c , sum) ) )

Cout :

( ( c ^ sum(A,B) ) v cout(A,B) )

-(-(c ^ sum) ^ -cout)

-(nand(c , sum) ^ -cout)

nand(nand(c , sum) , -cout)