Signed vs unsigned numbers

UNSIGNED

- BITS REPRESENTED BY POSITIVE INT
- CANNOT REPRESENT NEGS

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
0	0	1	0	1	1	0	0

= (+) 44

VS

SIGNED

- LEFTMOST BIT REPRESENTS SIGN OF NUMBER
  - 0 = POSITIVE
  - 1 = NEGATIVE

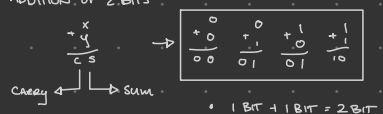
SIGN	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	0	1	0	1	1	0	0

= (-) 44

ADDITION OF UNSIGNED NUMBERS

SINGLE BIT

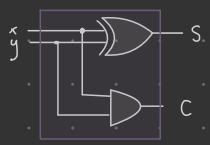
- ADDITION OF 2 BITS



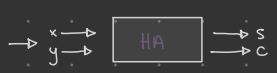
- 1 BIT + 1 BIT = 2 BIT

TRUTH TABLE

x	y	C	S
0	0	0	0
0	1	0	1
1	0	0	1
1	1	1	0



HALF ADDER

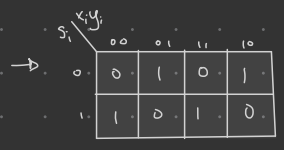


MULTIBIT

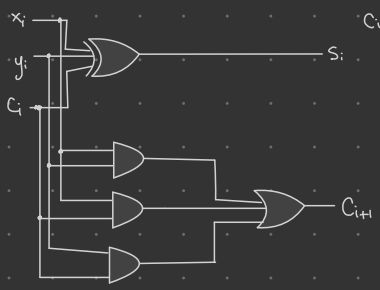
$C_3\ C_2\ C_1\ C_0$
$+\ x_2\ x_1\ x_0$
$y_2\ y_1\ y_0$
$S_2\ S_1\ S_0$

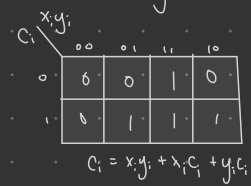
FULL ADDER

C_i	x_i	y_i	C_{i+1}	S_i
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1



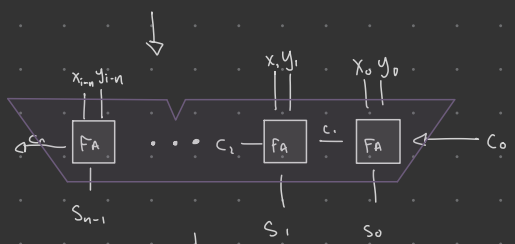
$S_i = x_i \oplus y_i \oplus C_i$

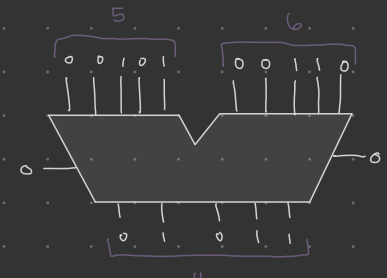


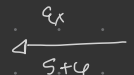


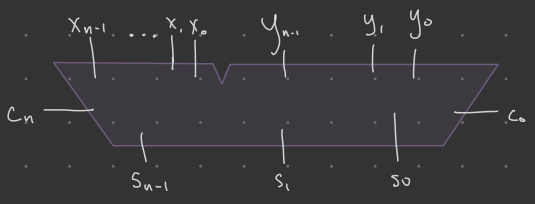
$C_i = x_i y_i + x_i C_i + y_i C_i$

FULL ADDER









SUBTRACTION OF UNSIGNED NUMBERS

- you SUBTRACT LOW FROM TOP
- BORROW IF NEED
- OVERFLOW IF GREATEST BIT HAS TO BORROW

$$
\begin{array}{r}
\overset{2}{\cancel{0}}\,\overset{2}{\cancel{0}}\,2 \\
\cancel{1}\,\cancel{1}\,00 \\
-\ 1110 \\
\hline
1110
\end{array}
$$

& OVERFLOW