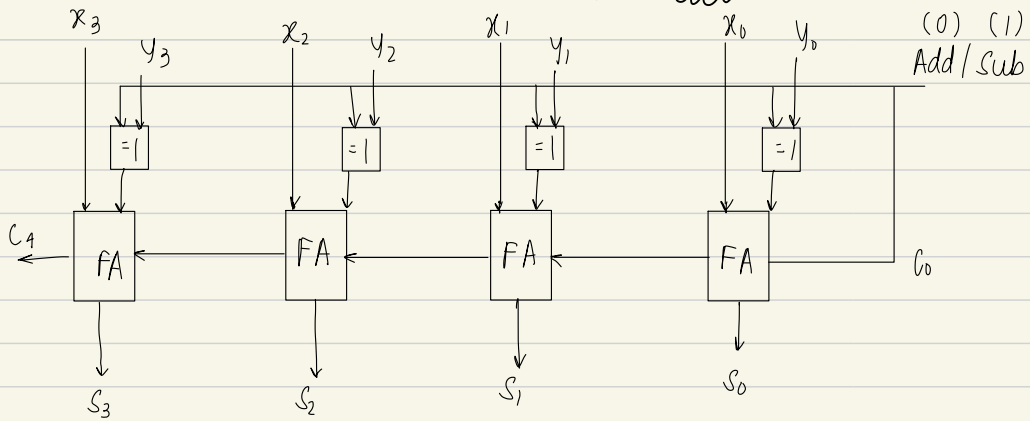
Combined adder+subtracter



- so the add/sub input helps convert to 2's comp if needed so lets see.

add I/P = 0

$y = 0\,0\,1\,1\,0\,1$

$+0$

$0\,0\,1\,1\,0\,1$

sub I/P = 1

$y = 1\,0\,0\,1\,1\,1\,0$

$0\,1\,1\,0\,0\,0\,1$

$+1$

$0\,1\,1\,0\,0\,1\,0$

↑ 2's complement of y

now XOR is odd no of 1s and incase of 2 inputs, diff I/P ⇒ 1, same input ⇒ 0 so when one input is 0, the output is equal to the other input and when one input = 1, the output is the opposite of the other input

AND this add/sub I/P also is the first carry. So incase of subtraction, the XOR gates take the 1's complement and this carry bit is the '1' that has to added to convert to 2's complement

imp, this sign det the add/sub I/P value

ex $2 + (-4)$

$X = 0010$

$Y = 1100$

$Y_{\text{into FA}} = 1100$

$C_0 = 0$

```
  0010
  1100
  ----
S → 1110
C4 = 0
```

$-2 - (-4)$

$X = 1110$

$Y = 1100$

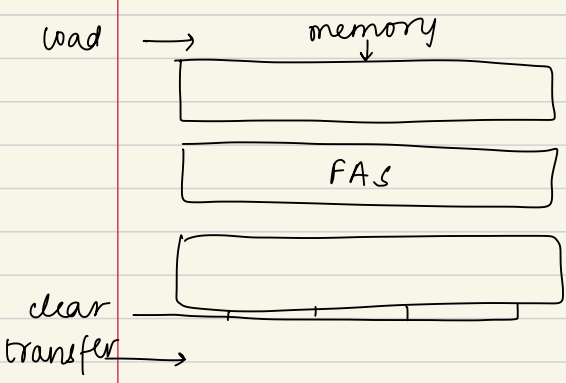
$Y_{\text{into FA}} = 0011$

$C_0 = 1$

```
   111
  1110
  0011
     1
  ----
 10010
  ↳ 2
```

$C_4 = 1$

- L5 vid 2 parallel adder w/ registers
- registers are digital memory circuits used to store digital data. N bit registers store N-bits of data



① clear A to zero
② load X to B from memory
③ add 0000 to X and store in A
④ load Y to B
⑤ add $X_{(A)}$ to $Y_{(B)}$ and store in A

6 5 4 3 2 1 0

1 1 0 0 1 1 0 → (64 + 32 + 4 + 2) = 102

− 1 1 1 1 0 0 1 → (64 + 32 + 16 + 8 + 1) = 121

= −19

$-64 + 32 + 1 + 4 + 8$

$-32 + 13$

$= -19$