Overflow → bit < data

memory bit

→ 5 bit data (+/−)
→ 5 bit data
Result 5 bit Any
1 extra

4bit
1111
5bit

Carry → overflow X

Case
Carry ✓ overflow X
Carry X overflow ✓

Unsigned (+ve)
4 bit Range 0 − (2^n − 1)
0 − 15

$2^3\ 2^2\ 2^1\ 2^0$
8 → 1 0 0 0
9 → 1 0 0 1
+
1 0 0 0 1
carry ↑ overflow

Signed Numbers 2's

4bit Range -2^{n-1} to $(2^{n-1}-1)$

−8 to 7

$2^3\ 2^2\ 2^1\ 2^0$
→ 0 1 0 1
2's → 1 0 1 1

Add
−5 → 1 0 1 1
+5 → 0 1 0 1
1 0 0 0 0
carry ↑ overflow X

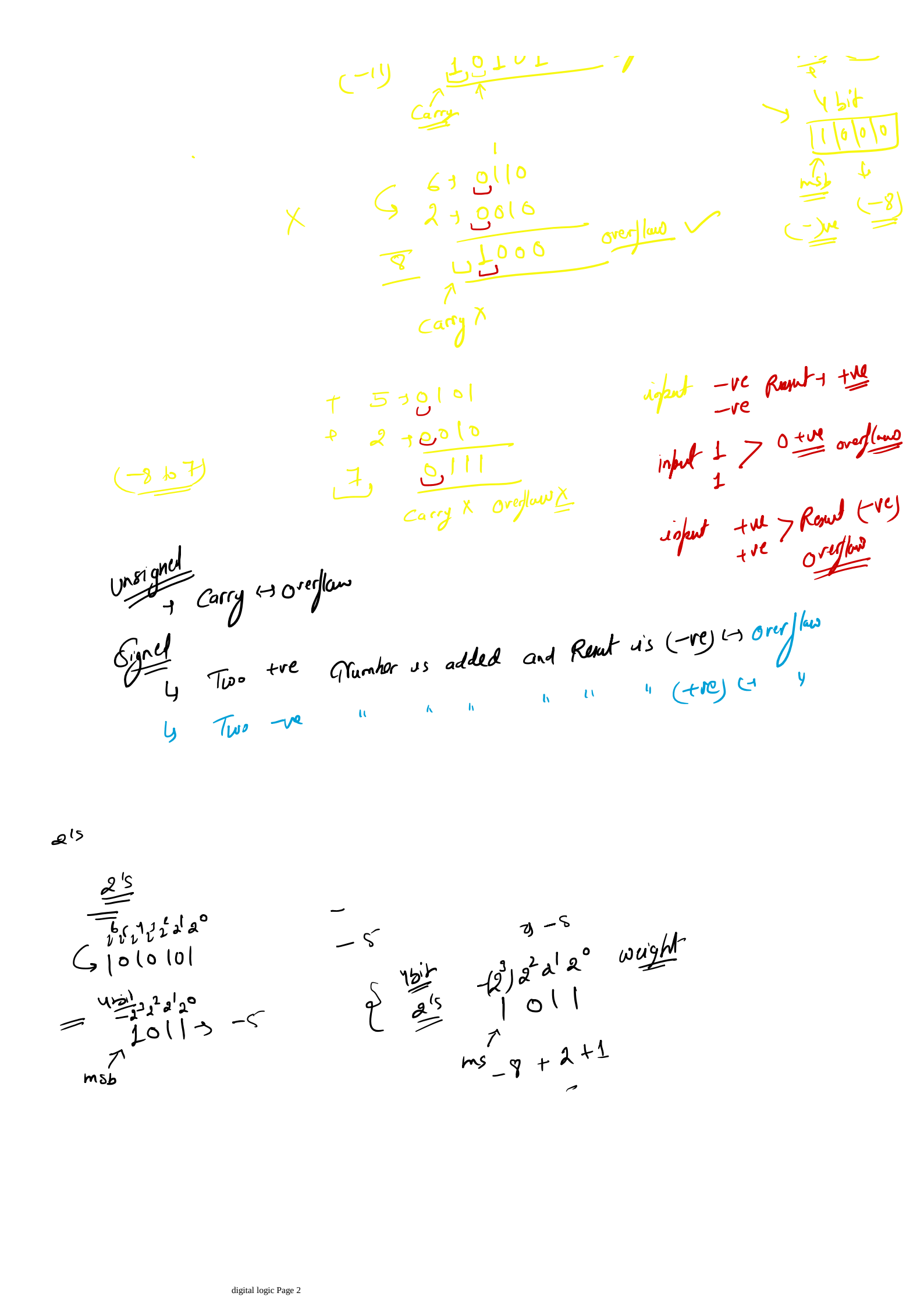
−5
+5
0

4 −5
4 +5
4 0000 dy
X

Range 4bit (−8 to 7)

−6 → 1 0 1 0
−5 → 1 0 1 1
(−11) 1 0 1 0 1
carry ↑ overflow ✓

5bit
0 1 0 0 0
msb (+8)
4 bit


(-11) 1 0 1 0 1
Carry
6 → 0 1 1 0
2 → 0 0 1 0
8 1 0 0 0
overflow ✓
Carry ✗
X
4 bit
1 0 0 0
msb
(-8)
(-)ve
(-8 to 7)
5 → 0 1 0 1
2 → 0 0 1 0
7 0 1 1 1
Carry ✗ overflow ✗
input -ve -ve Result → +ve
input 1 1 → 0 +ve overflow
input +ve +ve → Result (-ve) overflow
Unsigned → Carry ↔ overflow
Signed
↳ Two +ve Number is added and Result is (-ve) ↔ overflow
↳ Two -ve " " " " " (+ve) ↔ "
2's
2's
$b_3 b_2 b_1 b_0$ $2^3 2^2 2^1 2^0$
↳ 1 0 1 0 1 0 1
4 bit $2^3 2^2 2^1 2^0$
= 1 0 1 1 → -5
msb
-5
4 bit 2's
$-(2^3) 2^2 2^1 2^0$ weight
1 0 1 1
msb → -8 + 2 + 1