? Addition of integers - once complement we use in comp

37 (1) add the numbers directly
(2) Check for carry out
(3) Check the result
(4) Determine Overflow
(5) Interpret the Result

8 4 2 1
A → 5 → 0101 + 0101
B → -3 → 1100 1100
10001 → 0001 (in a 4 bit ones complement system) 5

(1) 32 bit is sign bit
if num - negative, sign bit 1
if num - positive, sign bit 0
if num = 0, sign bit 0
the rest of bits → magnitude

Ex(1): -2^{31} = sign bit magnitude = 0
1 000000 ... 0
32nd bit 111111

Ex(2): -1 = 1 000000 ... 1 = 1 in once complement
sign bit magnitude in actual computers
$-2^{31} + (2^{30} + \dots + 2^0)$
$2^{31} - 1 \Rightarrow -1$

0001
1
0010 → +2

$3^{11} \Rightarrow 11 = (1011)_2 \Rightarrow 3^{11} = 3^8 3^2 3^1$

$3^2 = 9$

$3^4 = 9^2 = 81$

$3^8 = (81)^2 = 6561$

$3^{11} = 3^8 \cdot 3^2 \cdot 3^1 = 6561 \cdot 9 \cdot 3 = 177,147$

---

(13) for 2's complement expantions

(1) convert integers to 2's complement

(2) add 2's complement represent

(3) handle the carry (if applicable)

(4) calcul final result

A = 5 0101

B = -3 in binary (4-bit) $\Rightarrow$ 1101

$$\begin{array}{r} 0101 \\ +\ 1101 \\ \hline 10010 \end{array} \Rightarrow 2, \text{ so } 5+(-3) = 2$$

ignore the carry that exceeds the bit width

+3 = 0011

-3 = 1100 + 0001 = 1101

0011 + 1101 = 0000 ✓