

Signed numbers

1. In computers, how are negative numbers typically stored in binary (base 2) format?
 - (a) Directly using a negative sign bit.
 - (b) You can't store negative numbers in binary
 - (c) By using an extra bit to store the negative sign
 - (d) By using Two's Complement
2. In which bit is the sign held in Two's Complement?
3. What does a 1 indicate in the bit that holds the sign?
4. Explain the steps involved in finding the negative value of a binary number using Two's Complement.
5. Given the binary number 0011 (positive), what is its two's complement representation?
6. What number does the Two's complement representation 10001100 represent?

ANSWERS

1. D signed numbers are represented using Two's Complement.
2. The sign is held in the Most Significant Bit. This is the left-hand bit.
3. If there is a 1 in the MSB, it means the number is negative. 1 indicates – and 0 indicates +
4. To find the Two's Complement of an unsigned binary number:
Write out the unsigned number
Copy down the unsigned number FROM THE RIGHT HAND SIDE (the Least Significant Bit) up to and including the first 1.
Then reverse the rest of the bits...ie. Make 1s into 0s and 0s into 1s.
The result is the Two's Complement number.
Check the answer. REMEMBER: that the MSB in 8-bit Two's Complement has a value of -128
5. 0011 becomes 1101
The MSB is worth -8
0011 is 3
 $-8 + 4 + 1 = -3$
6. 10001100 is a Two's Complement number. Write it out in a table with the place values

-128	64	32	16	8	4	2	1
1	0	0	0	1	1	0	0

Do the sum: $-128 + 8 + 4 = -116$