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0. Base in the base-x number system means that it's x to the power of the index(in reverse order). In the base-10 number system, for example, 47 would be $(4 \cdot 10^1) + (7 \cdot 10^0)$.

1. Binary is a system that uses base-2, using numbers 0 and 1. The binary system is very important in CS because it is used to turn things like transistors on and off efficiently and swiftly.

2. Binary to Decimal Algorithm

total=0

Start with the rightmost digit, if it is 1, then add 2^0 to the total. If the digit is 0 instead of one, do not add anything to the total. Move onto the next digit and so on, adding $2^{(i+1)}$ to the total, till you reach the last number. i is the previous exponent, and will always increase by one even if there is a 0 instead of 1.

For example, for 1011, we start with the rightmost digit. Since it is 1, we add 2^0 to the total of 0. Moving on, add 2^1 to 1 (2^0), making the total 3. We then face a 0, so we add nothing. The last number is one, so we add 2^3 to 3 which is 11. $1011_2 = 11$.

3. Decimal to Binary

total=0

binary=' '

d=decimal

The key to converting from decimal to binary is %2.

d=233

d%2=1

binary+=(d%2)

d//=2

...

7//2=3

3%2=1

binary+=1

1//2=0

stop!

binary='10010111'

Repeat the bolded till d is = to 0. By the end of this example, the binary should equal "10010111". However, you have to reverse the order since we started from the biggest power of 2, meaning the final answer is 11101001_2 .