Binary to Decimal:

- Each digit in binary represents a power of 2
- Starting from the right: 2^0, 2^1, 2^2…
- The decimal answer is the sum of all the powers of 2 that have a 1 in its corresponding slot
- Example:
    - **1011 0101**
    - 2^0 + 2^2 + 2^4 + 2^5 + 2^7 = **181**

Decimal to Binary:

- Every decimal number can be expressed as a sum of binary numbers (use binary-decimal conversions as proof)
- Basic algorithm:
    - Given a decimal number, find the biggest power of 2 that can fit inside that number
    - Subtract that power of 2 from that number
    - Repeat the process until you get 0
    - The resulting binary number is the result of all those powers of 2 (put a 1 for each corresponding binary digit used, 0 if it's not used)
    - (Optional): Split into groups of 4 and add 0's to make it even
- Example:
    - **300**
    - 300 = 256 + 32 + 8 + 4
    - 2^8 + 2^5 + 2^3 + 2^2
    - **0001 0010 1100**

Hexadecimal to Binary:

- Hex numbers go from 0-9, A-F
- Easy way is to first convert to binary
    - Convert each hexadecimal digit into a set of 4 binary numbers
    - Convert that binary number to decimal
- Example:
    - **A9**
    - A = 10 = 1010
    - 9 = 1001
    - 1010 1001
    - 1010 1001 = 2^0 + 2^3 + 2^5 + 2^7 = **169**

Decimal to Hexadecimal:

- Easier (in my opinion) to convert the decimal into its binary equivalent
- Split the binary numbers into groups of 4
- Convert each set of 4 binary numbers into its corresponding hexadecimal digit
- Example:
    - **72**
    - 72 = 0100 1000 = **48** (NOTE THAT 48 IN HEX IS NOT THE SAME AS 48 IN DECIMAL)