Exercises: XOR Operations

Spreadsheet Exercise

To begin with, download the Excel spreadsheet: `02b-xor.xlsx`. We will use some more functions to allow us to apply the `XOR` operation to bits first, then whole words. Make use of the IFERROR function where appropriate to make the sheet work more smoothly.

1. On the first sheet, called '`XOR`bits', enter a single plaintext character in Cell B2.
2. In Cell C2 use the CODE function to turn your plaintext character into a denary number.
3. In Cell D2, use the DEC2BIN function to turn the decimal code number into a binary number. This function takes two inputs: the decimal number (in Cell C2) and the number of bits the binary number should be. We are going to use 8-bit binary strings. E.g., '`=DEC2BIN(C2,8)`'.
4. In Cell E2, use the similar BIN2HEX function to turn the binary number into hexadecimal.
5. In Cell B3, enter a binary string. E.g., `00111101`. If your number starts with 0s, we will need to ensure that it keeps these. Do this by using BIN2DEC in Cell C3, before converting back to binary using DEC2BIN (specifying 8 bits) in Cell D3.
6. In Cells B6 to I6, use the MID function to split the binary plaintext number into its individual bits. Do the same in cells B7 to I7 for the binary key.
7. In Cell B8 use the BITXOR function to `XOR` the bits in Cell B6 and B7. E.g., '`=BITXOR(B6,B7)`'. Drag this across the row.
8. In Cell D11, use the CONCAT function to stick the `XOR`-ed bits together from Cells B8:I8.
9. Use BIN2DEC in Cell C11 before using CHAR in Cell B11 to retrieve the encrypted character. (This may not be a letter of the alphabet!)
10. The BITXOR function takes decimal numbers as input, `XOR`s their binary representations, then outputs a decimal number again. We can make use of this to perform quicker calculations. In Cell C15, use the BITXOR function taking input from Cells C2 and C3, then use DEC2BIN in Cell

D15 to check we get the same as doing the operation on the individual bits, and CHAR to retrieve the character in Cell B15.

11. The second sheet '`XOR`-words' has a plaintext string and a key string. Use the functions you have learnt so far to split these characters out in the relevant rows before performing `XOR` on the bits.