Exploring ASCII

ASCII stands for the American Standard Code for Information Interchange. It's a system used to represent English characters, and it was designed to encode 128 different characters. The table below maps the uppercase alphabet to 7-digit values.

A 1000 001	B 1000 010	C 1000 011	D 1000 100	E 1000 101	F 1000 110
G 1000 111	H 1001 000	I 1001 001	J 1001 010	K 1001 011	L 1001 100
M 1001 101	N 1001 110	O 1001 111	P 1010 000	Q 1010 001	R 1010 010
S 1010 011	T 1010 100	U 1010 101	V 1010 110	W 1010 111	X 1011 000
Y 1011 001	Z 1011 010				

Part I. First try translating this message from binary numbers to English letters:

1000 010 1000 101 1000 111 1001 001 1001 110

_____ _____ _____ _____ _____

Part II. Encode your own message using the binary representation of each alphabetic character that you use. Write each binary number on the lines below. Your message may be anywhere from 8 – 15 letters long. Then trade with a friend and see if you can decode each other's messages.

_____ _____ _____ _____ _____

_____ _____ _____ _____ _____

_____ _____ _____ _____ _____

Part III. Two friends named Alice and Bob are exchanging messages using ASCII code. It looks like Alice may have made a mistake when she converted her letters into binary. Can you find Alice's mistake? Once you have found where she went wrong, describe Alice's mistake on the lines below and correct her binary message.

1001 000 1000 100 1001 100 1001 100 1001 111

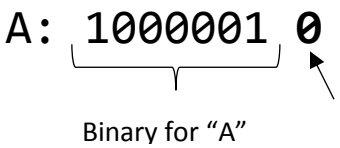
1000 010 1001 111 1000 010

_____

_____

Using Parity for Error Checking

When saving data to your computer or sending data over the internet, errors can happen. The character "A" only takes seven binary bits (zeros and ones) to represent, and the eighth bit is used as a ***parity*** bit to try and detect if an error happened while saving the letter to your computer.



Below is part of the ASCII table (the part that shows capital letters) with parity bit shown in **bold**:

A 1000 001**0**	B 1000 010**0**	C 1000 011**1**	D 1000 100**0**	E 1000 101**1**	F 1000 110**1**
G 1000 111**0**	H 1001 000**0**	I 1001 001**1**	J 1001 010**1**	K 1001 011**0**	L 1001 100**1**
M 1001 101**0**	N 1001 110**0**	O 1001 111**1**	P 1010 000**0**	Q 1010 001**1**	R 1010 010**1**
S 1010 011**0**	T 1010 100**1**	U 1010 101**0**	V 1010 110**0**		

Part I.

a) How man bits (zeros and ones) are used to represent the letter C, without a parity bit? ____
b) What parity bit is used for the letter C (circle one)? **1** or **0**
c) Why is 1 used as the parity bit for J, rather than 0?

_____

_____

Part II. Complete the table by filling in the parity bit for the letters W,X,Y and Z. **Remember that a parity bit is 0 if there are an *even* number of 1's in the binary number, or it is 1 if there are an *odd* number of 1's in the binary number.**

W 1010 111		X 1011 000		Y 1011 001		Z 1011 010	

Part III. Below is the same message as in the first worksheet, but this time it was sent with parity bits. Is there an error in the message? **First, underline the parity bits, then circle a binary number if you think it was sent incorrectly.**

1000 0100 1000 1011 1000 1110 1001 0010 1001 1100

Error Passing Game

Computer

1. Come up with a letter in your head. Using worksheet 1, translate the letter to binary and write the binary representation down on the line below.

   _____

2. Decide whether a 0 or 1 should be used as the parity bit. Re-write the parity bit in the blank below. **Remember that a parity bit is 0 if there are an *even* number of 1's in the binary number, or it is 1 if there are an *odd* number of 1's in the binary number.**

   _____ _____

   Binary value for letter — Parity bit

3. Pass your sheet of paper to the person in the middle.

Message Passer

1. Double check that the computer has selected the correct parity bit. **Remember that a parity bit is 0 if there are an *even* number of 1's in the binary number, or it is 1 if there are an *odd* number of 1's in the binary number.** If the computer has selected an incorrect parity bit, help them fix their error.

2. You get to choose whether you like to make an error or not! If you would like to make an error, recopy the computer's binary letter value below, but change ONE of the bits. If you would not like to make an error, then copy the binary value for the letter as is.
   - You CANNOT change more than one bit.
   - You CANNOT change the parity bit.

   _____ _____

   Binary value for letter — Parity bit

3. Pass your sheet of paper (but NOT the original paper) to other computer to see if they can determine whether you made an error or not.