Digital Data Representation and Storage

We've learned that all computerized information is stored as binary – a numerical system in which only two states are possible. We generally think of this representation as a sequence of '0's and '1's.

In this webquest, you'll use websites I outline as well as your favorite search engine to answer a series of questions related to digital data storage and representation. You should come away with a better understanding of how information is represented by computers.

Data storage

1. To represent the number 5634, how many bits do I need? (try search for '5634 in binary' using Google)

2. The largest harddrives currently on the market have a capacity of approximately 5 terabytes. How many bits are in a terabyte?

3. Roughly how many MP3s can be stored in a terabyte of space? How many hours of music is this?

4. *Extra: how are bits encoded on a harddrive? On a CD-ROM? In other words, what is a 1 and what is a 0? We know it can't be high and low voltage since when we power off our computers our data is still there. Hint: search for how CDs work.*

Digital images

1. As we discussed, colors in digital pictures are represented numerically. Designers and web developers often describe colors in hexadecimal. What is hexadecimal and how is it related to binary?

2. Use a hex color chart (such as http://www.2createawebsite.com/build/hex-colors.html#colorgenerator) and write how your favorite color is represented both in hexadecimal and in decimal (*hint: in decimal, you'll have three values for red, green and blue*).

3. Using a hex to binary to decimal converter (such as http://easycalculation.com/hex-converter.php) – how many bits would it take to represent your color in binary?

4. How many colors can be represented this way? (use your converter – the biggest color value in hexadecimal is FFFFFF for white)

5. What is lossless compression?

6. Give three examples of common image formats that are lossless:

7. Download the flower image linked from the class calendar. Shrink and compress it to the smallest file size with a maximum width of 640 using http://www.imageoptimizer.net/ Where are compression errors most visible? Why do you think this is? You may want to review the Wikipedia page on image compression.