ASCII reference: https://www.asciitable.com/

Some examples:

Letter A

ASCII binary representation of A. ASCII turns on 26 which is 64 for uppercase letters. (Lower case letters turn on the 64 and the 32). The 20 or 1 is also turned on because A is the first letter of the alphabet. I turn on the 1,2,4,8,16 that will tell which letter of the alphabet it is. Using 1,2,4,8,16 you can make the numbers from 1-26 which lets you have a code for all letters of the alphabet. Note that I have the place value of 0 or 1 and the positional value of powers of 2 since we are dealing with binary.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
| 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 |

The decimal for an A would be 64 + 1 which equals 65.

For hexadecimal remember that all hexadecimal (digits 0-F) can be represented in 4 binary positions. That means we separate into 2 groups of 4 and each will represent a hexadecimal character. So when we lay things out as I did below we can see that in the first group the 4 is on and in the second group the 1 is on so we have a hexadecimal 41 (4116).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| 23 | 22 | 21 | 20 | 23 | 22 | 21 | 20 |

Now let’s look at the letter G which is the 7th letter of the alphabet

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |
| 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
| 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 |

The decimal for G is therefore 64 + 4 + 2 + 1 or 71

Now let’s look at the hexadecimal below. We see that the first group of four is 4 and the next group is 7 so the hexadecimal is 47 (4716)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |
| 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| 23 | 22 | 21 | 20 | 23 | 22 | 21 | 20 |

Now let’s look at the letter L

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
| 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 |

The decimal for L is therefore 64 + 8 + 4 or 76

The hexadecimal will be 4 for the first group. The second group is 8 + 4 which is 12 which C in hexadecimal so the answer is 4C (4C16)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| 23 | 22 | 21 | 20 | 23 | 22 | 21 | 20 |

Now I want to look at converting Decimal representation to its ASCII character and then converting hexadecimal representation to its ASCII character.

If you are given the decimal 71 that we just saw above and want to convert it to ASCII and figure out what character it is. We have to determine where the 1s and 0s go. 128 is bigger than 71 so we cannot use that and so we put in a 0. We can use 64 as part of building the ASCII code so we put a 1 there. We then check to see what is left. 71 – 64 is 7 so we need to turn on 7 more. 32 is to big as is 16 and 8 so they get a 0 as their value. 4 can be taken from 7 so we turn that on and so we have 7-4 = 3. We can subtract 2 from 3 so we use a 1 as the value over the positional value of 2. 3 – 2 = 1 so we put use the 1 over the 20 and we have the ASCII code and can now find the character. The 1 over 64 tells us it is an uppercase letter. The 4,2,1 are on which means it is the 7th letter of the alphabet which is G.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |
| 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
| 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 |

Looking at the hexadecimal we look at the first group of four and see the 4 is turned on which makes it a capital letter and in the second group of four the 4,2,1 are turned on which makes it the 7th letter or G.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |
| 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| 23 | 22 | 21 | 20 | 23 | 22 | 21 | 20 |

And now the assignment

Problem #1: Following the layout I did for A and then G and L, do it for W and then for w.

Problem #2: Using ASCII, the decimal 67 73 83 convert to what letters of the alphabet?

Problem #3: Using ASCII, the hexadecimal 4E 54 5A converts to what letters of the alphabet?

Problem #4: Using ASCII, what letter of the alphabet is 01010000?

Problem #5: Using ASCII, what is the decimal and what is the hex for the number 6?

Problem #6: Using ASCII, show the 8 digit binary code for the number 6.

Problem #7: I wrote a text file in notepad and then opened it so that you could see the hexadecimal translation of what I wrote. Look at the hexadecimal translation and then tell me what I wrote for the last two lines. Your answers should be in character (be aware of cases).

A computer screen shot of a computer screen

Description automatically generated