CSC 35

Name: Quin Darcy
Instructor: Devin Cook

Due Date: 2/22/21
Assignment: Lab 1

Convert the following numbers into binary.

1. 42

   Solution. We begin by breaking 42 down into a linear combination of powers of 2. Since this only requires one byte, then we start by determining the largest power of 2, m_0, such that $2^{m_0} \leq 42$ and where $0 \leq m_0 \leq 7$. In this case, it $m_0 = 5$. From there we do the same but with $42\text{-}2^5 = 10$ instead of 42. This gives $m_1 = 3$. Repeating this we get $m_2 = 1$. Hence,

   $$42 = 32 + 8 + 2 = (0)2^7 + (0)2^6 + (1)2^5 + (0)2^4 + (1)2^3 + (0)2^2 + (1)2^1 + (0)2^0.$$

   Finally, collecting the coefficients on the powers of 2 we obtain

   $$42_2 = \texttt{00101010}.$$

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2. 451

   Solution. We do the same as above and get that

   $$\begin{aligned} 451 &= 256 + 195 \\ &= 256 + 128 + 67 \\ &= 256 + 128 + 64 + 3 \\ &= 256 + 128 + 64 + 2 + 1 \\ &= \sum_{k=0}^{15} a_i 2^{15-i}, \end{aligned}$$

   where $a_i = 0$ for $0 \leq i \leq 6$, $a_i = 1$ for $7 \leq i \leq 9$, $a_i = 0$ for $10 \leq i \leq 13$, $a_{14} = 1$, and $a_{15} = 0$. Thus

   $$451_2 = \texttt{00000001 11000010}.$$

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Convert the following strings into a series of bytes. Leave the result in hexadecimal.

1. Sacramento State

   Solution. By referring to the ASCII chart, the conversion of the above string is as follows:

   Sacramento State = `53 61 63 72 61 6D 65 6E 74 6F 20 53 74 61 74 65`.

   ■

2. My name is Quin.

   Solution. By doing the same as we did above we get

   My name is Quin = `4D 79 20 6E 61 6D 65 20 69 73 20 51 75 69 6E`.

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