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EE334 Homework: Digital Thinking

Work the following problems.

1. You want to scan a gray-scale image into your computer. The image is 5 inches by 5 inches. You select the following options for the scan: 200 dots per inch (dpi, which is the same as pixels per inch) and 256 shades of gray. How many bits will be produced for the scan?

2. You decide that the scan in problem #1 was not good enough, so you increase the scan parameters to 300 dpi and increase the shades of gray to 1024. How many times larger is the digitized image now versus the one in problem #1?

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3. Consider the following binary stream.

   01010100011010000110010101110010011001010010000001100001011010010110111000100111011101000010000001101110011011110010000001110011011101010110001101101000001000000111010001101000011010010110111001100111001000000110000101110011001000000110000100100000011001100111001001100101011001010010000001101100011101010110111001100011011010000010111 0

   a. If the binary stream consists of 12-bit unsigned numbers, how many numbers are there?

   b. Suppose the binary stream is a segment of digitized audio. Each sound sample represents one of 64 amplitude levels and the samples were spaced 0.0001 seconds apart. How many seconds worth of music is in the stream?

   c. OK, all the above are lies. The binary stream is really an 8-bit extended ASCII coded message. Visit the website http://www.ascii-code.com/ and use the tables there to decode the message.

   d. Items (a) – (c) show that by itself binary data (or any kind of digitized data) is just so much gibberish. Generally speaking, what do you need to know to about binary data in order to make sense of it?